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THE TEACHER SPEAKS

NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

THE TEACHER SPEAKS

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DIRECTORATE OF EXTENSION PROGRAMME
FOR SECONDAY EDUCATION
National Council of Educational Research and Training

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FOREWORD

From time immemorial, successful and enterprising teachers all over the world have been making new experiments in the art of teaching. But no systematic effort has perhaps ever been made in this country to encourage the teachers to write down their own experiences and experiments in teaching in order to communicate the same to others who are working in the field of education.

The Directorate of Extension Programmes for Secondary Education (National Council of Educational Research & Training) realizing the importance of disseminating such teaching experiences among teachers and others who are interested in education has started an effective and valuable programme which is called the Programme of Seminar Readings. Since 1962-63, the Directorate of Extension Programmes for Secondary Education has been carrying out this programme with the help of all the State Departments of Education and its own Extension Services Departments attached to Secondary Training Colleges.

Under the programme of Seminar Readings, the classroom teachers, headmasters, training college staff and others in the field of education are encouraged to write essays on their experiences and experiments in teaching on topics selected and announced by the Directorate of Extension Programmes for Secondary Education.

I am pleased to note that the 20 best essays selected in the first All-India Competition of Seminar Readings for the year 1962-63 are being printed in this volume, entitled *The Teacher Speaks* which seems to be an appropriate title. I am glad to learn that every effort has been made to maintain the originality of the ideas of the authors.

It is planned that the All-India Competition of Seminar Readings will be held every year and such publications will be brought out annually. All the authors, Extension Services Departments, State Departments of Education and the Directorate of Extension Programmes for Secondary Education and all the examiners who have helped in this significant task deserve our congratulations. I sincerely believe that teachers, headmasters, education officers and training college lecturers will find this book interesting and useful, and the ideas which they find valuable will be applied in classrooms with a view to making the process of teaching and learning more effective.

New Delhi,
December 26, 1964

P. N. Kirpal
Secretary to the Government of India
Ministry of Education.

PREFACE

The programme of Seminar Readings, initiated about three years ago by the Directorate of Extension Programmes for Secondary Education (National Council of Educational Research and Training) is a unique venture and experiment in the field of education. Through the Seminar Readings, the Directorate has embarked upon a programme which is expected to bring about the desired reconstruction in the field of teaching methods, curriculum and evaluation.

This is the first time in the history of Indian education that a formal effort has been made to encourage practising teachers to give thought to the teaching procedures and techniques which they found most effective in the course of their teaching careers and to write detailed papers on them in order to communicate these techniques and procedures to all the teachers and other workers in the field of education. For the first time, more than 800 practising teachers and principals of secondary schools and others have written essays on their practical educational experiences and experiments. The number of examiners of these papers was equally large. At the Extension centre-level contests all over the country, more than 200 educationists and at the state-level contests, approximately 50 educators examined these essays in order to select the best ones.

All the states cooperated whole-heartedly with the Directorate of Extension Programmes for Secondary Education in this vast project by organizing state-level contests for the selection of best papers.

The Directorate of Extension Programmes for Secondary Education then got the papers, received from the States, examined at the national level and finally selected 20 best papers for the All-India Awards of Rs. 500 each. The authors of the best papers were invited to attend the first National Meet of the prize winners of Seminar Readings and during the three-day conference the National Awardees who represented most of the States, got together, read out their papers and discussed in detail the effective methods of teaching various school subjects, techniques of solving educational problems, and improving school practices in the light of their own professional experiences. The discussion groups of awardees were fortunate in getting the expert guidance of specialists of the National Council and the Teachers' College Columbia University and Ohio State University teams.

The results of the first year's experience of the All-India Programme of Seminar Readings have been very encouraging and have proved beyond doubt the usefulness of the project and, therefore, the National Council intends to continue this programme with the same zeal and vigour in the years to come.

It may be pointed out that we have avoided any change or modification in the original essays. Although an editorial committee of four educationists was appointed to study these papers, they were requested not to modify the ideas expressed by the authors and also to avoid any change in the language as far as possible.

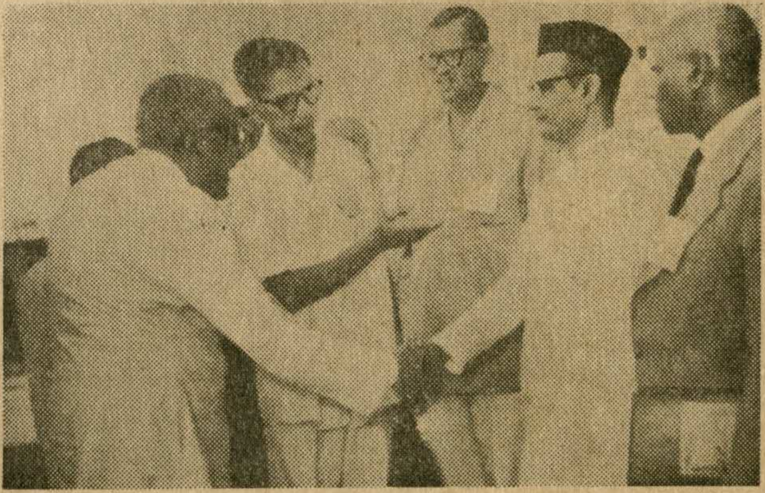
The views expressed in the essays in this volume do not necessarily represent the views of the National Council of Educational Research and Training. Each of the distinguished author is responsible for the views expressed in his own chapter.

I take this opportunity to offer my grateful thanks to the Directors of Public Instruction/Education, the Honorary Directors and Coordinators of Extension Services Centres and Units, the contributors, the examiners who assessed more than 800 papers for this All-India Competition, the members of the Editorial Committee, and to all others WHO HAVE HELPED US IN ONE WAY OR ANOTHER in making this Programme successful. I am exceedingly grateful to Shri M. C. Chagla, Minister of Education, Government of India and Shri P. N. Kirpal, Secretary to the Government of India, Ministry of Education, who in spite of their varied activities and heavy schedule of engagements graced the closing function with their presence.

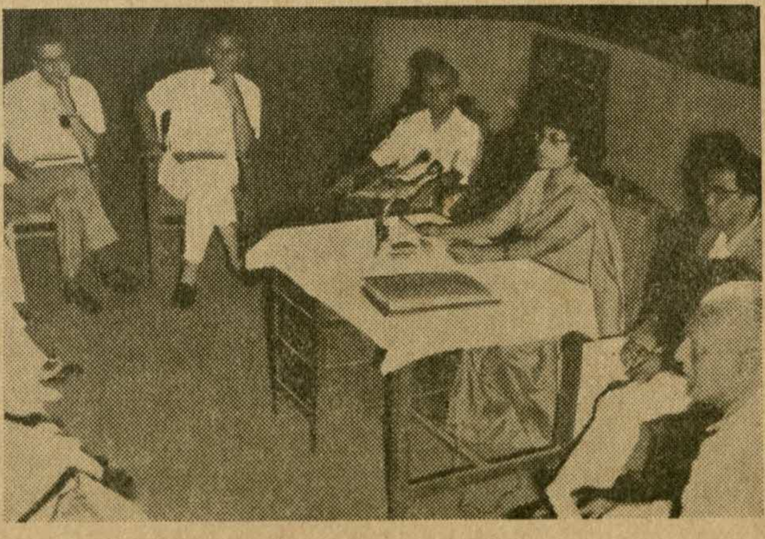
Lancers Road,
Timarpur, Delhi 6

December 24, 1964

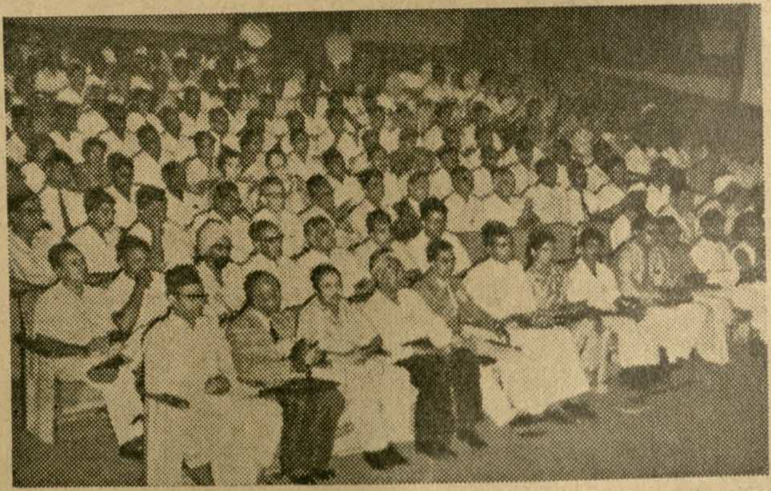
A. C. DEVE GOWDA
Director
Directorate of Extension Programmes
for Secondary Education



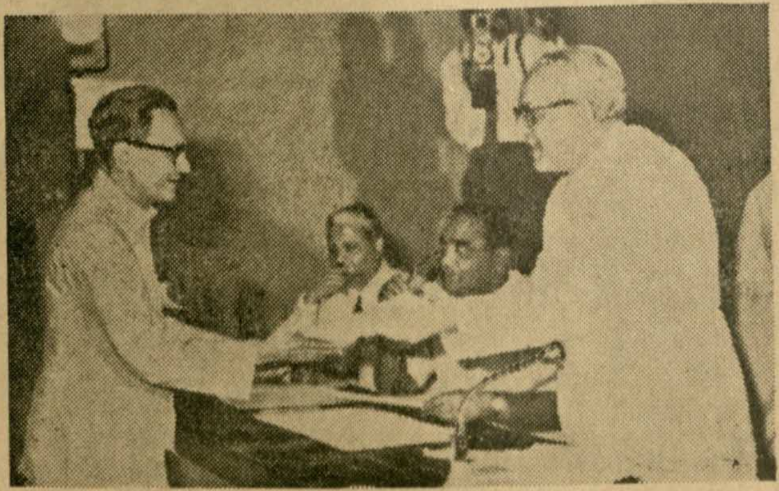
Dr. A. Raoof, Field Adviser, D.E.P.S.E. introducing the National Awardees to the Union Education Minister, Shri M. C. Chagla



Some National Awardees during a discussion of their papers



The National Awardees and guests at the closing function



Shri M.C. Chagla, Union Education Minister presenting a certificate and cash prize of Rs. 500 to a National Awardee

THE ALL-INDIA COMPETITION OF SEMINAR READINGS 1962-63

In the year 1962-63, the Directorate of Extension Programmes for Secondary Education (National Council of Educational Research and Training) initiated the Programme of Seminar Readings in cooperation with the State Departments of Education and the Extension Services Centres and Units all over the country. The major objective of this programme has to provide to the teachers and other educational workers means of making significant educational experiences widely known.

It is felt that teachers, educational administrators, students of education and other educational workers have, out of their experience and knowledge, made a significant contribution to a clear understanding of the various educational issues which we are facing today.

It is also felt that the experience which they have acquired and the knowledge they have gained through study and research, when shared with other workers in the educational field, will enrich educational thought and practice.

In view of these, the Directorate of Extension Programmes for Secondary Education invited teachers, educational administrators, students of education and all those interested in the cause of education to participate in this programme and contribute papers on the suggested topics.

The Directorate suggested that papers may be based on experience or on the results of experiments, research or studies that may have been carried out by the contributors. The papers may deal with topics in their philosophical or historical aspects or be based on practical experience.

The prospective authors were requested to write papers in any modern Indian language in use in schools or in English. It was decided that if a paper has been written in a modern Indian language and is selected for the All-India Competition, the contributor would be requested to make available an English translation of the paper. It was suggested that the length of each paper may be from 2000 to 2500 words. The procedure adopted for the execution of the scheme was this:

The contributors were requested to send their papers to the nearest Extension Services Centre or Unit by a given date.

Each Extension Services Centre, on receipt of the papers, submitted them to a panel of three judges who selected the 10 best papers amongst them. The Centre then organized a reading and discussion of these papers in order to provide the writers and other educationists an opportunity to discuss in some detail the various issues raised in the papers.

Each Centre then sent the ten best papers to its State Dapartment of Education for a state-level contest. All papers received from different Centres and Units were sent by the State Department to a panel of judges who in turn selected the ten best papers among them for a state-level discussion and for transmission to Delhi for the All-India Competition. It was also decided that the papers selected in the All-India Competition should be published for wide circulation and, a cash award of Rs. 500 be given to each contributor whose contribution was adjudged outstanding.

The following topics were selected for the papers of Seminar Readings for the year 1962-63:

- Standard of education in secondary schools
- Improvement of science teaching in schools
- How to make teaching and learning more effective in secondary schools with reference to specific school subjects
- Social studies in the Secondary School curriculum
- Improving instructional aids and their effective utilization
- Education of talented pupils in secondary schools
- System of examination at the secondary stage—does it need a change?
- Health education in secondary schools.

More than 800 teachers and headmasters of secondary schools, lecturers of training colleges and others belonging to 13 states participated in the All-India Competition.

The States selected 94 papers after assessment and forwarded them to DEPSE for the All-India Competition of Seminar Readings 1962-63. The examiners appointed by DEPSE for the final assessment of the papers, selected the 20 best papers for the All-India Awards. The names of the authors of these papers are given in Appendix 5.

The climax to the programme was the All-India Conference which was held at Delhi from April 8 to 10, 1964. The finally selected best papers were divided into three groups according to subject areas. At least two subject experts were attached to each of the three groups. Each of the 20 papers was read out by its author and was discussed in the group for any modifications, if necessary.

These 20 selected papers are being published in this volume for wide circulation. The remaining papers of the Seminar Readings Programme which had not been selected for the Awards were examined carefully, and the best among them are being published in educational journals like *Teacher Education, School Science, Social Studies Teacher, Education Quarterly, Secondary Education,* and *Audio-Visual Education.*

DEPSE
Delhi.

A. Raoof
Field Adviser

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CURRICULUM AND TEACHING METHODS GENERAL

PART I

1

TEACHING AND LEARNING GEOGRAPHY

CATHERINE ELLEN PETERS

THE WORLD Agricultural Fair was on in Delhi. I was alone going through the fair in pursuit of knowledge and entertainment. It was now the U.P. State Pavilion I was going through. I came upon a model entitled Soil Conservation. The Intermediate geography textbook just that year, had included a chapter on Soil Conservation. I looked for the address. It was Rehman Khera, near Lucknow, just where I belonged to. I took down the address and moved on. There was the Chinese pavilion. I collected pamphlets, noted statistics on coal, textiles, water, power resources, tea and rice cultivation, etc. There was the Russian pavilion and I hungrily collected what literature I could, repeating this in as many pavilions as I could go through. On my return to school, after the Christmas vacation, I did some spade work. I rang up Rehman Khera, discovered it is a government Soil Conservation and Reclamation centre, some twelve miles from Lucknow. I fixed a preview visit. As a result, I discovered the place afforded many more opportunities. They had apparatus for climatic data, the thermometers, the raingauge, the wind vane. They also had survey paraphernalia, chain tape and plane table—just the things we had to learn about. I felt I had come upon an oasis in my teaching of geography but oasis it was literally, for the villagers had vacated the area (except for two poverty stricken families), because of severe erosion, when the government had opened the demonstration centre.

In class, we dealt with the concepts of erosion and conservation—why and how, what causes erosion? Today we will step out, and make some observations about the surface soil on our campus, I told them. We had a period of outdoor geography we moved in a group, and said aloud any observations with regard to colour, texture and appearance, erosion in its various stages. How can it be prevented? We had come inside and students were beginning to ask questions.[1] 'Thinking seems to occur from a variety of stimuli. Curiosity is one of the most impelling of these and one which begins to work in humans at an early age. What makes the sun rise? What are colours? What makes the valley? Questions tugging at the mind of man have led him to think and to discover.'

How can soil be reclaimed? How can it be conserved? Was answered with the help of pictures, knowledge of economics and more observation. Then to motivate, further, I told the class what they could see if we all took a trip to a place called Rehman Khera. Interest became high. They asked to go for an excursion, and preparation was set in motion. We listed some questions to be answered as a result of observation, e.g., what techniques of soil conservation and reclamation are under experiment at Rehman Khera? and other points.

Practical details having been worked out, we arrived in Rehman Khera. The experts welcomed us. First a talk was given in the auditorium, then in the brilliance of a sunlit February day the observation tour ensued. We asked questions, 'What were the chief causes of erosion at that particular locality?' We jotted impressions, listed techniques, contour farming, grass and forest plots for afforestation. We picked up soil, dug out potatoes, compared sugar-cane crops, and saw the perfect meander of the SAT KATA NALA. We also divided up a groups—some observed and read and learnt to read the maximum and minimum thermometers. The other groups were introduced to plane table field surveying, another to chain and tape. Now according to the text, the section on practicals would be taught last, or wherever placed as a section by itself but here the significant thing was that we learnt how this apparatus was used in acquiring knowledge about land use and its problems. This is what made it meaningful. Providing context and relationships to isolated topics in the course of study makes it come alive.

---

[1] HELEN, McCracken Carpenter, *Skills in Social Studies*, Twenty-fourth Yearbook of the National Council for the Social Studies, 1953, p. 46.

On the way back we noted the old bridge on the nala, with the inscription in Urdu—a touch of history. We hated to return after a good whole day. The experience of learning together away from the formality of the school house had brought a sense of togetherness. Spirits were high. A follow-up was easily planned. A description of the total experience, listing and describing techniques of soil conservation, building a sand table model of experimental farming, actual trying out of chain and tape survey were some of the things the group decided to work on in groups. One student whose father had done considerable research in the history of Lucknow and its environs, offered to investigate into the past history of Rehman Khera with his help.

This on-the-spot learning experience illustrates the invaluable importance of field trip or excursion in making the teaching-learning of geography very effective. It highlights the following points:

1. Achieving certain objectives in the teaching of geography
   —To understand how environment affects man
   —To learn how man has modified his environment
   —To understand natural forces such as weather and seasons
   —To understand phenomena about the earth
   —To learn the value of conservation of soil and all natural resources
   —To use maps, globes and other apparatus
2. The initiative of the teacher which led her to discover useful information, to further exploring and turning the experience into meaningful learning. A deep interest in the subject, a love of exploration and adventure in the teacher are ideal breeding grounds of the same in the students.
3. Collection of collateral material at the World Fair.
4. Outdoor observation which preceded the field trip stimulates interest, arouses curiosity which results in questions, and provides a relaxed setting for learning. 'Education', according to Bining and Bining 'should be natural and informal'.
5. The value of experience—we learn what we experience is an acknowledged psychological principle. Erosion, its consequences, conservation and reclamation, river meander, are not mere textbook topic heads any more for me or my students, but have become the reality of experienced phenomena.
6. A reasonable balance between actual experience and vicarious learning and activities and formal study.

7. The value of recapitulation. It came easily too for the learning experience had been worthwhile and happy.

Discovery of Alaska

The Intermediate textbook in its description of U.S.A. did not include Alaska. It had recently become the forty-ninth State. The U.S. Information Library in town, announced a film show as part of their regular film feature. It was Alaska the forty-ninth State. I promptly telephoned to the Library's film section to lend the film. In my spare time I previewed the film twice. I made a list of questions that students would find answers for as they saw the film. In class we did a thorough map study of Alaska. That done, we were ready now to learn about the other geographical aspects of Alaska. We were going to do that with the help of a film I announced. They took down the list of questions which pointed to the kind of soil, vegetation, crops, agricultural methods, way of life both in Anchorage, a modern American city, and further inland of the Eskimos for whom the aeroplane is still a novelty. They went over the list for a few minutes, as we have no desk lights. We saw the film. A period of sharing retained impressions followed, and each individual was to write out vivid impressions for homework. Then the points were organized, and an illustrated pamphlet was the outcome. We got our missing material on Alaska. Later this was supplemented with material from an article in the *National Geographical Magazine*.

Textbooks

What a topic for dicussion! Poor, insufficient textbooks. This class experiment shows that there are ways and means called audio-visual aids which are capable of supplementing the inadequacy even most of the time honoured textbook. Again this teaching-learning experience has certain 'points to remember' which contributed to its effectiveness.

—Alertness of the teacher to what's on in the community.

—Audio-visual aids as best supplement. *They do not replace all other approaches to learning.*

Carefully chosen aids, most apt and relevant alone, can make learning-teaching effective.

—Importance of teacher preparation—preview of film, an important must.

—Appropriate time and mode of use of the audio-visual aid. In this case, following a map study of Alaska.

- —Value of shared impressions. Group participation is effective learning for it helps to complete and enrich learned material.
- —Home-work, emerging out of class activity, and leading to its completion and further outcome, is an effective tool in effective teaching-learning.
- —Further supplementing the acquired material as more became available.

The audio-visual aids offer rich possibilities in effective teaching-learning.

Project Himalaya

The news of the Chinese attack came on 20 October 1963. We were studying world communications—just the right base to take off from—the importance of communications in times of war. Newspapers were recognised as means of communication, but how the news came through and many other questions came up. In a day or two when the maps of Ladakh and NEFA were published, it was the students who expressed their eagerness to study those regions. Soon the inquiry was named Project Himalaya. The class participated in listing the geographical aspects we wished to learn about. The following topics were compiled.

—Physical features
—Nature of terrain
—Nature of vegetation
—Mineral wealth
—Means of transportation
—Power resources
—Peoples—means of livelihood, customs, religion ancestry
—Present economic importance
—Possibilities of future development

How would we do it? This is what the group listed:

Investigate for sources of material on Ladakh and NEFA
—from the school library
—from the public library
—from the Information Centre
—be on the look out for any radio talks

Make enlarged maps of the areas
—physical maps
—outline maps to show
—important names and places and rivers and the Macmahon Line
—roads and passes
—mineral wealth
—areas occupied by the Chinese

—Sand table model of the Himalayan terrain

—Collect pictures, bring magazines to class with material

At this point a student suggested we should also study the importance of the Himalayas to India. It was agreed upon as a preliminary to the study of the two particular regions, and that this would be a group session in which each individual would participate. Next the students volunteered to work on the various activities according to their interest, ability and possibility. Those residing in the hostel could not look for sources of material outside the school library. Those days, scholars who volunteered were given information as to how and when they could go to the possible places for the information.

The map groups were asked to be on the look out for new maps in the newspapers every day. They decided to buy a class newspaper. In deciding the how for mapwork, enlargement and reduction of maps were taken up as an exercise by the teacher for the whole class. The group then could hardly wait to begin on their own.

Dr. W. H. Burton,[2] in his chapter, Implications for Organization of Instruction and Instructional Adjuncts, in applying principles of learning to the improvement of instruction at different levels of school work, says, 'utilize all the time necessary for explanations, for answering pupil questions, for developing an adequate plan of action, for arranging subsidiary individual and committee assignments and for making sure that all know what is to be done. The time necessary may vary from a few minutes to two periods or more.'

The group session on 'Advantages of the Himalayas' then took place with the help of a physical map and several pictures which individuals had brought, e.g., of glaciers giving rise to rivers of forest wealth of the Himalayas, of shrubs used for medicinal purposes, of tea gardens, of pasture lands. As part of explaining the influence of the Himalayas on the rainfall of India, a further assignment of reviewing how the monsoons originate was assigned to two, who would practise sketch maps for blackboard work. The class then expressed the opinion that they wanted to record the points listed that day in project books and illustrate them with pictures and objects where possible. They suggested that ten marks be given for grading the project books. We settled on five.

Meanwhile, the teacher herself searched for material. She visited the State Information Department where the assistant director agreed to have an exhibition prepared as a source of information for Project Himalaya. The Information Centre did not have the needed material. But at the public library, the librarian disclosed that he had a precious volume on Ladakh which he said was rare but he was happy that it was being asked for and brought it out with great care and pride. The teacher spent three interesting evenings going through the volume and taking notes. In class she informed the material-finding group that she had some material to supplement theirs. So they could spend some time after class with her and organize what they had found. This preliminary preparation was done as part of classwork and was carried right on into assignment. All through this, there was a sense of worthwhileness of our chosen study, for the newspapers were still carrying news and maps of NEFA and Ladakh, and some of us were going as chance permitted to visit the wounded in the military hospital, some were bringing gifts for the jawans. Thus, motivation for study was in the very situation.

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[2] National Society for the Study of Education, Forty-ninth Year Book, Part 1, p. 232.

The maps made by the map-making group were displayed on the general bulletin board. They were borrowed by a church women's group and a general English class. The students were proud to supply the material. In conclusion each group was applauded. Individuals were praised for outstanding contribution and again one could feel a sense of togetherness in the group, an eagerness, a sense of cheerful participation. All through those days, the geography room was a veritable laboratory, where I found students working on the maps or on the sand table or on the illustrated project books, etc., and I must truthfully confess no discipline problem was faced—in fact it was solved. Wesley,[3] in discussing group dynamics says, "In order to utilize the group as a dynamic force, the teacher must create an integrated class. This calls for the right kind of leadership." "Further on, he says, "successful operation of a group or class requires that its members provide a variety of abilities attributes."

How clearly then does this teaching-learning experiment illustrate the value of correlating current events in the effective teaching-learning of geography! Some other guide posts to effective learning-teaching that emerge from this are:

—Alertness to current questions
—Teachers' response to the initiative and eagerness of students
—Defining of goals of the study by the teacher and the students
—Purposeful activity alone brings a sense of satisfaction. If the aims are quite clear, they afford a strong motivation. The students then challenge their own ability and interest to try and achieve them
—Group discussion and decision on the methods of achieving their defined goals. The activities planned are no longer forced but desired.
—A balance and relationship between outside classroom resources and actual teaching by the teacher

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[3] Edgar Bruce Wesley, *Teaching Social Studies in High Schools*, D. C. Health & Co. Boston, pp. 222-223.

- The use of simple visual aids; prepared and contributed by the students
- Group activities chosen according to interest and ability by the student group
- A class project—the group decided to buy class newspaper
- The teacher's search for new material herself
- Contribution of the public librarian
- A sense of worthwhileness of the study. This in itself is a strong motivating factor
- The outflow of knowledge and study of current events into fruitful service — visits to the wounded, help for the jawans.

In discussing the teaching of geography, Wesley[4] states, 'it should provide a great variety of reading materials, original projects and activities which will afford each student an opportunity to achieve the varied kinds of success of which he is capable.'

And what of social needs? While working together we experienced a sense of fellowship. There was acceptance of each group's contribution, and recognition was given, e.g., approbation and approval of neatly made charts and maps. For as Wesley[5] points, 'Praise is a wonderful reward if sincere and timely. To give it the teacher should be sensitive, alert and generous at all times.' 'For in each of these learning situations not skills alone, but also the emotions of people are involved.'[6]

Project China

The next step in our study was the result of a remark by a student. In a language class in our school the grade IX children refused one day to study a particular book because it contained a story depicting friendship of an Indian doctor for the Chinese. The question was then raised, should we as students of geography know about the Chinese and their land or should we ignore it from our study of geography. At this point, opinions were expressed, the meaning of geography had to be stated — definition reviewed and it was the consensus that we should set about studying the geography of China as our neighbour. The whole process of Project China was put into operation. Now the pamphlets I had picked up from the Chinese pavilion, giving statistics and description of mineral exploitation, agricultural practices in the Communes, water power resouces, etc., added to the fund of material. The National Geographic proved a valuable source of information on Mongolia, Tibet, and Sinkiang. In a group session we tried to see what geographical advantages we could get from this study.

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[4] Edgar Bruce Wesley. *Teaching Social Studies in High School*,pp. 217-218.

[5] *op. cit.* 211.

[6] National Society for the Study of Education, Forty-ninth Year Book, Part 1, p. 162.

The following were listed:

We could compare and contrast the geographical problems of China and India:

— vast territories
— vast populations
— vast lands not put under use
— a large peasant class
— mineral resources not tapped yet
— inequality of wealth
— industrial backwardness

When nearing conclusion, a student suggested we should study our other neighbours, Ceylon, Pakistan, Nepal, Sikkim, Bhutan and Burma; and a strange coincidence happened. The February 1963 issue of the *National Geographic* that came had within it as the first feature, *Burma, Gentle Neighbour of India and Red China.*

The entire study of this section, puts into clear focus the aims of teaching geography. Geography is the study of the relationship between man and his environment. The study should lead to an understanding and appreciation of how people live and work; how the environment affects their lives, ideas, customs, and how those in one region affect the lives of others. Its study should promote better understanding among individuals, groups and the nations of the world. Development of skills necessary to sound geographic thinking and needed for an understanding of social data should also play a part in the specific aims of geography.

We Think Geography

That same week, one morning, as we were ready to begin the class, there were several hands waving hectically. I said, does that mean you have some geographical news you want to share? Yes, they said, and one girl informed the class that the Oxford and Phillip's Atlases were banned for use by the government. She had heard it over the radio. We discussed why, and soon it was decided we would order the new atlases, which we did. The next day, two girls had the new atlases, published by the Surveyor General of India.

In sharing experiences once with the class, the teacher had told the students, how she loves to think geography,[7] in all possible connections and places — in reading newspapers, in listening to the radio, in the movies, the news reels, in current events, in everyday phenomena of nature — this morning the students reflected their having caught the idea.

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[7] That this business of learning Geography was not a matter of studying it for a period a day. It was really being alert to anything geographical and learning from it.

Study of our Northern Neighbours

Now we are planning the study of our northern neighbours —Nepal, Sikkim and Bhutan. For the study of Nepal two resource people from the community came to mind — an English doctor who worked for several years in Kathmandu and is most interested in sharing her knowledge and materials of interest from Nepal, e.g., costume, jewellery, objects of art. The other is my teacher-friend who has slides which she took herself. Also, I consulted the U.S.I.L. film catalogue and discovered to my great joy that they have a colour film 'Himalayan Awakening', dealing with the life and problems of modern Nepal, and showing some beautiful mountain scenery. The group has decided that they would do the initial preparation — maps, sand table model, and collecting of materials and pictures. I have suggested that they see the film first of all. This would be the introduction and motivation. Then in the next session we coud have their reports, and supplement them with asking the two people to come with their slides and materials. The students have asked that we invite the English doctor to give a talk. They have also suggested that we open our study sessions on Nepal to any interested staff members and students.

The Casual Give and Take

Two special maps of the *National Geographic* thrilled me no end. One, of the continent of Antartica, the other of the Pacific Ocean. There are two students who in interest and ability surpass the average group. 'Bagya and Kamna, come and look at the globe with me.' They came and we talked about the new Indian atlas and as we rotated the globe, and conversed about maps in general, I handed them the two new shiny maps. Keep them clean, will you? Would you like to report to the class your map study sometime? Their eyes glowed, and I was grateful we could share and learn together.

Dale B. Harris in discussing how children learn interests, motives and attitudes, says, "The apparently significant effect of the casual and incidental in modifying children's attitudes and interests has frequently been remarked. The difference lies in the more personal relationship established in the 'off-guard' moment as contrasted with the more structured situation."[8]

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[8] National Society for the Study of Education, Forty-ninth Year Book, Part I, Learning and Instruction, p. 153.

In summarizing, my conclusion is that no one theory, method or approach is adequate or effective; that skilful adaptation both of material and method at every step, will produce effective teaching-learning; that the learner is the chief actor in the drama of learning, that the teacher is but the director in the play; that it is the personality of the teacher, her knowledge and interest in the teaching of geography, her desire to create fruitful interpersonal relationships for all pupils, her ceaseless effort in finding and accepting projects and activities suggested by the students for the purpose of enabling students to achieve, and to find themselves the secret in making teaching-learning effective in geography.

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TEACHING OF ENGLISH

P. N. BHOJA RAO

THE PROBLEM of the falling standards in English in our country is one of the most urgent problems confronting us. This low standard of English is deplored by everyone interested in the education of our youth and the progress of our country. But the persons who are most concerned are the teachers, especially the English teachers. The attainment of our pupils is so low that, when they reach the tenth standard, nearly 90 per cent of them are not able to express the simplest ideas in their own sentences. One can easily realize how this deterioration becomes cumulative in most of these pupils who pass out of our schools because of the present-day methods of evaluation. Many of them go for higher studies where the medium of instruction and examination is English, and many others become teachers in our primary schools. The deterioration continues at the college level also, thereby lowering the standard of English of those who take up the teaching profession. Altogether, the situation has become so serious that it has created a sense of frustration, nay, despondency, in the teaching profession. Their desperation has led some members of the profession to suggest the desperate remedy of abolition of English as a compulsory subject and its retention only as an optional subject. But the consequences of such a step would be far-reaching and hence it is not to be thought of for a long time to come.

This is not the place to discuss the pros and cons of retaining English as the official language of our country or as the medium of instruction and examination in our universities. Suffice it to state with the utmost emphasis that, as long as English is a subject of compulsory study in our schools and colleges, it must be taught effectively so that our pupils attain an adequate standard in it when they leave school or college, and that remedial measures must be taken not only to arrest the deterioration in the standard but to raise the standard to the desired level.

Now, for taking any measures to remedy the situation the causes that have led to this grave problem must be clearly understood and analyzed. The basic causes that gave rise to this problem are not far to seek. One such basic cause is the significant change in the objectives of teaching the language to our children, after independence. Prior to independence English was taught not merely as the official language and medium of instruction; the cultural objective had as much importance as, if not more than, the utilitarian objective. The British policy, at least in the earlier years, was to westernize the Indians by the introduction of western culture, western ideas, traditions, customs and manners, western institutions and last but not least, the western system of education through the medium of English. Naturally, English held the dominant position in the curriculum at all stages of education. It was compulsorily taught from the third or fourth year of school right up to the degree stage. The highest number of periods was allotted to it in the time-table of the school, say ten or twelve periods a week. It was, moreover, the medium of instruction in the high school classes. The study of literature or, as far as the high school classes were concerned, at least the literary approach, was given as much importance as, if not more importance than, the study of language. No wonder that a high standard of English was expected at the matriculation or school-leaving level. Accuracy of language and spelling on the part of matriculate was taken for granted and any candidate of the S. L. C. examination who aimed at higher than pass marks had to prove his ability in style, diction and organization of ideas. Indeed, a pretty high standard did exist in those days. This state which may look like a happy dream to the present-day teacher of English lasted till about three decades ago and then a slow deterioration set in, the causes of which are rather obscure and are worthy of investigation. However, in my view the fall in standard then was due, broadly speaking, to the political situation in the country and the rise in the strength of the classes and I dare say even in this there is a lesson for educationists. Then in about 1940, when the mother-tongue of regional language was rightly made the medium of instruction, the deterioration in the standard of English in high schools took a turn for the worse although the number of periods devoted to the study of English remained the same. No educationist can or will object to this long overdue reform but the consequent fall in the standard of English of the pupils would seem to disprove conclusively the pet theory of some protagonists of the mother-tongue or regional language medium that this reform, far from adversely affecting the standard of English, will or should actually improve it.

Many seemingly convincing arguments were adduced in favour of this theory. Indeed this was a theory that I was taught to believe in when I was doing my L.T. course in 1939 and I remember after my training I used to argue vehemently with my senior colleagues in the school in which I was working when they attributed the falling standard in English to the introduction of the vernacular medium. But alas! disillusionment was not far off.

Since 1946 there has been a further fall in the standard of English. It was in that year that English which was being taught from the fourth year of school till then began to be taught from the sixth year and the last blow on the teaching of English fell in 1949, when the periods allotted to the subject in the curriculum were reduced from nine or ten to six to make provision for the compulsory study of Hindi and to raise the status of the mother-tongue or the regional language in the curriculum.

The disastrous fall in the standard during the last decade has opened our eyes and certain measures have been taken to remedy the situation. Revision of the curriculum in English, textbook reform and introduction of English at the earlier stages in which our South Indian States seem to have started a competition, are examples of the efforts made to cure the malady or at least to arrest its progress. Other hopeful steps are the starting of the Central Institute of English at Hyderabad and the proposal to start regional institutes, one of which is proposed to be established in Bangalore for the benefit of the teachers of the South Indian States and the conduct of refresher courses, workshops and seminars by certain educational agencies such as the departments of education in the States, the department of extension services and the British Council. In this connection, it will not be out of place if I pay my humble tribute of praise to the Department of Extension Services of our district for the yeoman service rendered by it to the teaching profession not only by way of organizing workshops and seminars but by all possible means under the able and inspiring direction of its popular coordinator, Sri. B. Bhavani Rao. We have also to acknowledge our debt of gratitude to the British Council for its selfless and most valuable service in the field of English studies.

All these steps are of undoubted value but it has to be admitted that they do not go far enough as may be seen from the poor results achieved so far. More intensive reforms and remedial measures are called for. Policy makers, curriculum makers, syllabus framers, textbook writers and most important of all, teachers of English at all stages, primary, secondary and collegiate, have to give urgent thought to this problem.

An awareness of the historical perspective will enable the teachers of English to have a clear understanding of the changed objective in the teaching of English in our country. The understanding of this objective is of the utmost importance to teachers as it has an important bearing not only on the curriculum and textbook but also on the methods and procedures to be followed in the teaching of the subject. The present-day objective is more utilitarian than cultural. The four-fold aim of learning English, namely, learning to read, understand, speak and write English, no doubt remains the same, but it is most important for all concerned to bear in mind that English is now taught less as a cultural subject than as a tool for the imparting and acquisition of knowledge and a means of international and inter-state communication. This changed objective has led to a reduction of the importance of English in the school curriculum. It is no longer the medium of instruction in high schools. The number of years devoted to its study and the number of periods allotted to it per week have been considerably reduced. In short, the dominant position in the curriculum that it held formerly has been taken by the mother-tongue or regional language and it now occupies the second place. Hence it follows that we have no justification for expecting the same standard of attainment in our pupils as existed about two decades ago, expedially with the added handicaps of classes of unwieldly strength and mass education and I may be excused for quoting the trite saying that 'you cannot have the cake and eat it too' or 'No, we have to be satisfied with a lower standard.' But here I have to make a fine distinction between the literary aspect and the language aspect and make it clearly understood that the justification for the lower standard applies only to the literary aspect and not in the least to the language aspect. The standard in respect of the language aspect must be maintained at an adequate level and this is certainly possible if concerted efforts in this direction are made by all concerned. But the most essential need is that in all our efforts we should keep in view the restricted objective. It should be reflected in framing the syllabus, preparing textbooks, choosing the methods of teaching and even in training English teachers.

The literature-centred approach must at once be given place to a language-centred one in respect of syllabuses, textbooks and methods of teaching. This has already been done to some extent in some of our States by the adoption of the structural approach in framing of the syllabuses and preparation of textbooks for the first three or four years of English teaching. But in the higher classes, the literary approach still holds the field. In our State, especially, literary selections are prescribed as textbooks instead of carefully prepared and graded textbooks, too much importance is given to the study of poetry and too much time and effort are wasted by the teachers in the interpretation of the subject-matter of the text, prose and poetry, at the expense of language study. If performs are introduced in these aspects of English teaching and in the training of teachers to teach English in keeping the changed objective, a corresponding improvement in the standard of achievement of our pupils is certain.

In the matter of curriculum, syllabus and textbooks and utmost that we teachers can do is to exert all the influence at our command on the authorities concerned to bring about the needed changes. But there is much else that we can do in the direction of raising the standard even under the present conditions if we make determined efforts. We have to overcome our sense of frustration and helplessness and work with a missionary zeal to achieve our aim in spite of all handicaps. We must bring to bear all our ability, enengy and enthusiasm on the work in hand. All opportunities for self-improvement such as workshops, seminars and refresher courses must be taken advantage of. We must keep abreast of latest developments in the field by reading educational journals. Every English teacher must aim at becoming an expert in his line by constant effort. Getting into a rut is one of the greatest evils that can befall a member of any profession, more so in the case of the teaching profession. In this context may I appeal to my brothers in the profession to earnestly try to put into practice the various improved methods they learn at the seminars, workshops and refresher courses they attend? We have to show their utility by actual results.

In the teaching of English, the beginning period is all important. It is then that the foundation for the whole edifice of English learning is laid. So it is essential that the ablest teachers with a good command of the language are allotted this work. It would be ideal if trained graduate teachers who have a special ability in the teaching of English handle the subject during the beginning stages. But the realization of this ideal may be far off.

As is well known, there are four general aims in the teaching of English: to teach pupils to hear and understand the spoken language, to understand what they read, to speak the language and to write it. But in the first few years learning to speak must be given predominance, because thereby the other aims can be more easily and quickly realized. Language is speech. Speech is the basis of expression, oral and written. At present the first few months of English teaching are devoted to oral work. But the unwieldy size of the classes lowers the effectiveness of oral work, because individual attention cannot be adequately given. Hence, it is absolutely necessary not only to increase the period of oral teaching in the beginning stage but also the rapidity of oral practice in order to overcome the handicap of large classes. Indeed the importance of oral work at all stages of English teaching cannot be over emphasized. The grade structures prescribed in the syllabus have to be taught by all effective means such as substitution table; completion of sentences and filling up the blanks. But while selecting vocabulary the present day objective of teaching English as a means of communication and medium of higher studies, especially, in science and technology, must be kept in view throughout the course even if this aspect is neglected in the syllabus and the textbook. Also, real life situations must be dealt with as far as possible. A strong incentive for learning English as also a sense of achievement must be created in the pupils by teaching them to express ordinary ideas, facts and events relating their own daily life, words and expression relating to home life, school life and industry, the various profession, travel, etc., must be progressively taught even if these do not find a place in the syllabus. Constant help and attention must be given to the backward children so that a sense of achievement in the learning of the language is created in them also from the very beginning.

I have already stated that the first few years constitute the most important stage in learning a new language. If, therefore, good pronunciation, correct grammar and sentence structure are carefully taught from the very beginning, there will be no need later to impose numerous corrective and remedial exercises. It is a well-known fact that it is far easier to teach new material than to eradicate old faulty habits.

In our country the most neglected aspect of English teaching is pronunciation. While so much attention is bestowed on most other aspects, nobody seems to care the least about this aspect although correct speech sounds are as important as, or even more important than, correct grammatical structure when a language is used as a means of oral communication. The reason lies perhaps in the greater stress placed upon the ability to write English than to speak it. But we should not forget that ability to speak English and thereby communicate orally with others at the inter-state and international levels is atleast one of the aims of learning that language and this aim can be achieved only if our speech is intelligible to others. The consequences of faulty pronunciation will be vividly brought home to us if we just try to converse with a friend in our mother-tongue while deliberately mispronouncing one or two words in each sentence. Then how is it that we are able to converse freely in English among ourselves in a perfectly intelligible manner? The reason is obvious. It is because the words that are mispronounced are common to most of us and our intonation is exactly that of our mother-tongue. We do not seem to make the least effort at correct intonation so that the sounds produced when we speak English are more or less similar to those of our mother-tongue.

A colleague once told me that whenever he pronounced correctly a word that is usually mispronounced, the pupils would look at each other and smile. That shows the extent to which our pupils are accustomed to wrong pronunciation on account of bad example. It would be interesting in this connection to know the experience of persons who have visited foreign countries where English is the national language or mother-tongue such as England and America and also the condition in countries where English is taught as a compulsory second language as in India. In no other context is the saying that example is better than precept truer than in this matter of pronunciation. Correct pronunciation, accentuation and intonation must be taught from the very beginning. Children must be given practice in the sounds which are peculiar to English. There is no scope for me in this paper to deal with this matter more elaborately. Suffice it to say that every English teacher should aim at perfection in speech by a study of phonetics, the use of a good pronouncing dictionary such as Daniel Jones', listening to English language broadcasts, consultation with colleagues, use of the linguaphone, and whenever possible, witnessing English films, and most important of all, by constant practice.

Another aspect that is sadly neglected is spelling. The only word to describe the spelling of most of our tenth standard pupils is 'horrible'. Now it has to be admitted that English spelling is arbitrary and often freakish. It is full of anomalies and inconsistencies. It does not correspond to the pronunciation. In other words English spelling is not phonetic. This no doubt is a great handicap to our children because almost all our languages are phonetic and the children are accustomed to spell the words according to their sounds. Hence the need for special attention to spelling in the teaching of English. It must be brought home to our pupils that accuracy in spelling is the mark of a well-educated person and that bad spelling denotes want of good education. Therefore, there is a vital need for inculcating in our pupils the habit of correct spelling throughout the course from the time of their entering the writing stage. At the same time all efforts must be made to eradicate habits of bad spelling. To achieve these aims, we have to adopt sound methods based on psychological principles discarding the old discredited methods. For this purpose, I cannot do better than recommend to my friends the excellent book *Suggestions for the Teaching of English Spelling in India* by H.R. Bhatia. And before leaving this topic it is enough if I say that transcription, different kinds of drill, word-building games and other play-way methods, dictation, effective use of the blackboard and encouraging the pupils to consult the teacher and the dictionary whenever in doubt, all these have a place in the teaching of spelling.

As far as I have observed, there is still another aspect of English teaching that is not given the importance it deserves. It is oral composition. Oral composition is different from oral preparation for a written composition. The latter is a means to an end whereas the former is an end in itself. In oral composition children are trained to speak continuously in a coherent manner for a few minutes. This will instil into them the much-needed confidence in the language, the use of English and improve their command of the language. In the textual lessons, even when emphasis is laid on oral work, pupils have little chance of speaking continuously in a few sentences. Most of the answers elicited from them are in single sentences. Oral composition should be introduced in the third year and continued throughout the course.

The topics chosen must be within the knowledge and experience of the children including the detailed and non-detailed texts. There must be intensive previous preparation under the guidance of the teacher. This is one of the aspects of English teaching that is best suited for group work. Each group may be given a different topic, each member of a group having to contribute a portion of the composition of his group so as to get a continuous narration, description, explanation or story in relation to each topic.

Coming to the teaching of the textbook, detailed and non-detailed, I shall deal with a few points only. At the present time it is not necessary to extol the virtues of the direct method to induce the teachers to adopt and stick to it conscientiously because the method has proved its value and attained an unshakable position as the quickest and most effective method of teaching a language although there may still be some teachers who, while paying lip service to it, freely deviate from it out of sheer laziness. Still it is good to remind ourselves now and then of the excellence of this method so that we may not deviate from it too often. The use of the mother-tongue is permissible only in the teaching of grammar and that too only to a limited extent.

In the treatment of the detailed text there is a tendency, especially in the higher classes, to give elaborate explanations of the subject-matter of the lessons. Under the present conditions of fewer periods for English and larger classes to be taught this can only be done at the expense of language practice. It was perhaps permissible in the old leisurely days when English was given precedence over knowledge subjects. Now these knowledge subjects have secured their due place in the curriculum and it

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is not one of the aims of English teaching to impart knowledge in various subjects. Hence we must resist the temptation to dwell too much on matter at the expence of language. Similarly, we have to cut down the time devoted to the study of poetry in view of our present-day aim of stressing the language aspect since poetry does not lend itself to lagnuage practice to the extent as prose. Poetry is now to be taught only for enjoyment and relief from monotony and so we have to be satisfied with a few questions for comprehension and appreciation and some amount of recitation.

In the higher classes practice in reading aloud may be restricted to poetry. Reading aloud of the prose lesson by a few of the pupils of the class serves no purpose and is to be regarded as more waste of precious time.

In the teaching of the detailed and non-detailed text it is of great benefit to the pupils to make them set questions on the passage or passages taken up for study. This will not only make the lesson more lively but also give the children valuable practice in framing interrogative sentences which they lack at present. Group work may be adopted here with great advantage.

The non-detailed text is not to be treated in the same way as the detailed text. The objectives of studying non-detailed texts are (1) to improve the pupils' ability in rapid silent reading, (2) to develop vocabulary, (3) to learn to deduce the meaning of unknown words from their contexts, and (4) to foster the habit of extensive reading. The method of teaching adopted should facilitate the achieving of these objectives. Self-study methods should be adopted here as far as possible. The various steps are: (1) setting of a number of short-answer questions for comprehension, (2) silent reading by the pupils, (3) oral discussion, (4) oral composition on suitable topics, and (5) a few written exercises.

In regard to the teaching of grammar, the controversy over formal grammar and functional grammar was laid to rest long ago and functional grammar now holds the field unchallenged. Also the problem of how much grammar is to be taught and at what stage it should be introduced, has been solved for us by the syllabus framers. Now the only question that concerns us is, 'How is grammar to be taught?'.

Modern educationists do not make any distinction between grammar study and language study. Hence grammar teaching concentrates on the practice of correct forms and avoids the use of technical terminology. It is associated with language teaching.

In the first two years of English, there is absolutely no need for the teaching of grammar as such. The children are taught to speak and write by pattern rather than rule. They rely on unconscious assimilation of the main principles of usage. This is done by the use of substitution tables, imitation of correct habits of speech and drill.

The teaching of elementary grammar should be started in the third year of English. Even here there is no need to assign a separate period for it. Organized teaching of grammar should be introduced in the fourth year of English. It should follow and not come before the ability to use the language. It should be carried on through the ample use of model sentences and numerous examples, through construction exercises such as sentence completion, parallel sentences and similar exercises and also through intensive question and answer. In other words, grammar should be taught on descriptive and inductive lines. The exercises should be framed within the vocabulary limits and structural patterns already known to the pupils. Hence, short connected and self-contained passages taken from the text will be suitable for grammar exercises.

The teaching of grammar should be correlated with the study of the readers and with oral and written composition. Grammar should be used for eradicating common errors in the speech and writing of pupils.

The use of the mother-tongue is justified in explaining the various points of grammar, for contrasting the grammatical features of both languages and for translating technical terms.

Now let me make a few observations about written composition. The point to be emphasized here is the need for thorough oral preparation. For without careful preparation, written compositions will not be of much use in learning the language. Good preparation is valuable from every point of view: it will reduce the opportunities for mistakes, enlarge vocabulary, ensure the right choice of words, phrases and structures, and help in the orderly arrangement of ideas. The outline of the composition and the new words, phrases and sometimes whole sentences should be written on the blackboard. The words that are habitually misspelt or wrongly inflected will also have to be written on the board especially for the benefit of the backward pupils. The better the preparation, the better the written work and the lighter the teacher's work of correction.

As for the oral composition, so here, the choice of subjects has to be given careful thought so that pupils would not have to face difficulties of subject-matter as well as difficulties of language. The aim of written composition in English at the secondary school stage should not be anything more than language practice. This practice is to increase the pupil's skill in handling the language and in using it clearly, correctly and effectively in description, narration and explanation.

In regard to correction of written work, the ideal method is for the teacher to mark the mistakes and the pupils to write the corrections with the help and guidance of the teacher. The other method of the teacher writing in all the corrections and the pupils rewriting the corrected exer-

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cises is not of much value as an exercise in language practice because most pupils do the copying mechanically and do not take note of the correct forms as against the incorrect forms used by them. But when a pupil is made to correct his mistakes himself, the correct versions leave a deeper impression on his mind. However, if for any reason a teacher is obliged to adopt the method of writing in the corrections and asking the pupils to re-write the corrected exercise, the least he should do is to make a list of the typical mistakes, classify them and set remedial exercises in a subsequent lesson or lessons. The time spent on this follow-up work is time well spent.

It is a good plan for the teacher to walk round the class when the pupils are writing the exercises, looking through their work and pointing out the mistakes if any committed by them. The pupils should be encouraged to read through their written work. Correct answers to language exercises may be written on the blackboard and then the children can correct their mistakes themselves.

Written composition affords the greatest scope for group work.

The subject of extensive reading needs no advocates. If our children are to have an adequate command of the English language and to be able to make good use of it after their school days, they must read a great deal in that language. Wide and regular reading consolidates all that has been gained and accustoms the mind to make use of the language as a natural and familiar medium of thought and expression. Besides, it enlarges their vocabulary, mainly, passive vocabulary, increases their general knowledge, and broadens their minds. Hence from the fourth year onwards children must be encouraged in all possible ways to read more and more books. In the past, when English enjoyed a prominent position in the curriculum, extensive reading by the pupils was taken for granted. Teachers had little difficulty in developing their pupils' interest in extensive reading. More often than not, it was the pupils who had difficulty in making the teacher take a sustained interest in this aspect of his work. Now, because of the restricted scope for the study of English, the situation is entirely changed and unless teachers keep up an unflagging campaign with patience and perseverance, our children will go without one of the most valuable ingredients of their educations. So let us enthuse our pupils in the direction of wide reading by all the means in our power such as the provision of books suited to the interests, tastes and standards of our pupils, efficient library service, proper guidance and advice in the choice of books, and timely help whenever it is found necessary. Once an interest in general reading is kindled in the children, it almost always becomes self-sustaining provided, of course, the proper environment for it has been created.

Compulsion has no place here. It may do more harm than good.

Even the practice of asking the pupils to maintain what are called 'library notes' is of little use unless it is done voluntarily. The books provided must be within the comprehension of the pupils. There must be simplified versions of classics, plays, travels, history, biography, adventure and romance and scientific discoveries and achievements. There must be as many books as possible with an Indian background.

If teachers succeed in inculcating this healthy habit in their pupils it will be one of the most valuable gifts they can give the future generation of this country.

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EDUCATION OF TALENTED CHILDREN IN SECONDARY SCHOOLS

MISS AKHTAR QAMBER

‘I THINK clever children should be segregated and not condemned to be slowed down by the dull ones in the interest of brotherhood. And I do not think we should sacrifice existing high standards in education to a hasty plan for making education democratic.’

The above statement, recently made by Iris Murdoch, one of England’s brilliant young novelists Lecturer in Philosophy at St. Ann’s College, Oxford, and a member of the Labour Party, is significant for a double reason—first that this view-point regarding the aristocracy of clever children is advocated not by a member of the right wing but by one whose allegiance is to the less privileged sections of society, and secondly, because it is the view-point of a novelist and philosopher with spontaneous insight into human nature and value rather than that of a professional educator in the restricted sense of the term.

Two or three cardinal problems of contemporary education have been thus placed before us. I would like to expand these with special reference to Indian education in secondary schools.

The first of these is a delicate and sentimental one. In a newly-established modern democracy, it is sacrilege to propose the separation of clever children from dull ones. We who have suffered under a system of privileges based on the caste system, on birth, wealth and power in our long history are chary of any positions of special consideration, however, legitimate. Even if the practical difficulties of selecting the most intelligent from among an anonymous crowd could be surmounted through an ingenious system of tests, the social and moral aspect of the segregation would remain deeply disturbing to all democratic-minded people. Education as a foundation for the good life is a birth right in every free society. The training and exercise of intellectual and spiritual freedoms are not only compulsions in the attainment of a full, rounded personality, but will also help to ensure a certain degree of desirable stability in material and economic concerns. Believing as we do in human rights and equalities, how is it possible not to sacrifice academic standards for a broad-based national education? At the school level every child must have equal opportunity, upto a point, even though the response is not equal. This usually means that education is geared to the average majority and sometimes, for compassionate reasons and for fear of social injustice, it includes the dullest but hardly ever the brightest. In a true democracy all three categories must find satisfying roles and development. Besides, many educators believe that since the gifted child will eventually return to a niche in a democratic society made up of individuals of widely varying abilities and since his removal from the average group reduces the effectiveness of regular classes, it is wise to keep the two groups together. To those who are seeking for a certain equality of life and are capable of it for themselves and for society, something that makes for excellence, if excellence is at all approachable in a world of beginning and imperfections, contemporary trends offer tremendous discouragement.

The key-note of our century is expansion with little room for refinement and subtlety. We go in for large plans, bigger and bigger projects, taller and taller buildings, higher and broader men. Nothing on small scale will satisfy us. The peculiar distinction of our times is mass production and although this kind of nomenclature is offensive in the realm of education, the historical phase in which we are placed points to the education of the millions. Mass advancement is good, but one wonders if indiscriminate mass production in education will be worthwhilt and lasting. It is relatively few men and women of insight, vision and perseverance who are responsible for progress.

Apart from the democratic sentiment and the craze for expansion at the expense of excellence, a third reason can be assigned to the neglect of the gifted child. This is the myth of the great man who is endowed by God, and needs no training above that which he receives in the common run or on his own initiative. A miraculous divinity adheres to such beings and their contribution to life and society is expected to be spontaneous. Thus it comes about that there has been little convincing basis for special provision for the talented. Even in the USA and England, interest in them is only a decade or so old.

Volume after volume has been written on the subject of children who are exceptional in the sense of being handicapped. Much attention is devoted to the care of the deaf, the blind, the crippled, slow-learning children, children of retarded growth in personality, the emotionally maladjusted, delinquent boys and girls, and to the psychology of the difficult child. In his book *Introduction to Exceptional Children*, Harry J. Baker, Director of Handicapped Psychological Clinic, Detroit, gives not even nine out of 500 pages to the rapid learner. Child guidance clinics mainly cater to the special needs of the difficult, the handicapped or the slow child, who is quick to be sighted. The superior drifts through school unchallenged. It is high time that immediate attention is paid to the nurture and growth of superior children for physical development, emotional and social maturity, adolescent adjustment, mental outlook and the shaping of personality. Fortunately, on account of our traditional respect for intellectual endeavour and learning in ancient India, the education of the gifted went on from time immemorial, although it was sporadic, depending on chance or desire or discovery. The Muslim rulers of the sixteenth century selected the fairest, the strongest and the most intelligent to be trained as leader. Plato's system of education in the ancient West expressed systematic concern for the variously gifted. Without apology, Plato assigned the most important role to the Philosopher-king who was to govern the state with justice, to conserve all human values of civilization and to act as steward of the intellectual and spiritual life. The Renaissance ideal, of the many-sided personality of which Leonardo da Vinci might be a symbol, was also that of the minority.

Interest in the gifted in the new sense is of very recent origin. Galton's book *Hereditary Genius* in 1869 was the first indication of attention to the subject. The researches of L.M. Terman, Leta Hollingworth and Paul Witty thirty years ago were repeatedly pointing to the special education of the talented child. Many recent publications since the war such as the very influential book *The Gifted Child Grows Up* by Terman and Oden, have made careful studies as to how to spot the intellectually superior. Terman and Oden describe 1528 children with I.Q. of 130 and above. They emphasize early identification. The important age for this purpose is ten, when exceptional children begin to show capabilities above those of the average child at the same age. According to Mrs. Hollingworth, there are one per cent superior children in every age group. Recognition of the gifted is as essential as special provisions for them.

For a long time it was thought that giftedness lay in superior intellect. A high I.Q. measured by the intelligence test was associated with all prominent achievement. The I.Q. was also believed to be stable but now the I.Q. is seldom the sole criterion. Besides, it may be blocked by meagre opportunity, insecurity or emotional difficulties. Further, it is discovered that a high I.Q. is not necessarily related to creativity in art, music and writing, nor can an I.Q. reveal these talents. The definition, according to modern educators, is extended to include many varieties of giftedness. Paul Witty says the gifted child is 'any child who in his age group is superior in some ability which may make him an outstanding contributor to the welfare of, and quality of living in society'. Although abstract and verbal intelligence is related to scholastic success, children who excel in one area may display no more than average ability in all others. So, it is necessary to discover other concepts of ability. For instance, a child may show general intellectual ability as expressed in rational thinking, mathematical skill, verbal power and spatial imagination. He may show special promise in science and mechanics, or talent for the creative arts, music, graphic art, writing or dramatics. He may have special gifts for human relationship and social leadership with qualities of tact and understanding.

The gifted, therefore, fall into at least four patterns, and each has a unique need for unique accomplishment in the world of business, government, labour, industry, education, art, journalism and scientific research.

Identification of superior children can be achieved through intelligence tests, aptitude tests, daily performance at school and at home, reports of teachers and parents likely to have insight into the children's abilities. Experiment with the above methods confirms certain general characteristics that belong to those whose I.Q. is 130 and above. The experience of experts, as well as one's own, reveals that instead of the traditional image of the flat-chested, the short-sighted and the socially retiring, the superior pupil is well-built and attractive and has physical stamina. He is emotionally well-adjusted, is socially at ease, is not snobbish. He is persevering and willing to spend overtime, to undergo discomfort and to face failure. He displays superior academic ability, is a skilful thinker, has an extensive vocabulary, is curious and asks more questions and more intelligent ones. (Here is the teacher's opportunity to answer truthfully and seriously and instead of giving him all the answers to direct him to appropriate sources of knowledge, encyclopaedia, etc., for he is capable of independent study). On the whole, his concern for intellectual and scientific problem is greater than his desire for social and material pursuits. He has unusual drive and may have two or three hobbies running simultaneously—photography, motors, painting, athletics, collection of stamps and other things.

Special provision in schools and outside should be made for the uniquely gifted. The ideal thing would be to have separate schools, where the needs of each child are taken care of. If public schools in India like the Doon School, Scindia School in Gwalior, Mayo School in Ajmer and Y.P.S. in Patiala did not have the disadvantage of being frightfully expensive, these types would be helpful for bright children as well as for the wealthy who are not bright. At the Doon School, for instance, each grade has three sections equivalent to A, B and C standards for science subjects and three sections for subjects grouped under English including history, geography, languages and such like. The rapid learner of the A and the slow learner of the C carry on at suitable speeds under separate masters. The number of years spent in the school is the same for all.

The following are a few helpful lines along which the needs of the gifted could be met. Since not all brighter children are able to afford high fees for special schooling, they could be supported with scholarships from State funds. Also, in the absence of special schools it is possible to arrange for them a diversified programme in the existing schools. At least, they could be separated into small classes and work with their intellectual peers at their own pace. There should be no compunction in so providing for the gifted. Many schools do, already, have remedial classes for the very mediocre to pull them up to the thirty-three per cent standard. The same could be done for the very bright. The needs of the A and the C groups are different. The principle is the same.

The superior pupil also needs the superior teacher with pleasing personality, a high degree of maturity, quick intelligence and a sense of vocation. He must be capable, and efficient with sensitivity and imagination. For such a teacher, conditions of service should be attractive so that he is freed from material anxiety. More than that, he should be able to work in an atmosphere of freedom and experiment. Children are quick to detect limitations on the freedom of their teachers.

Next to opportunities of the small class under able and gifted teachers, is the need for drawing up an enlarged syllabus. Bright children are usually two or three grades ahead of the average in general knowledge and show mastery of the requirement in half the time. Unchallenged, they would be encouraged in habits of neglect or indifference. They should, therefore, have a well-planned scholastic programme with additional subjects and intensive detail. Accelerations or skipping classes are bad for two reasons. They leave gaps in knowledge. For instance if the geography of Europe is taught in the 7th standard, then by skipping from the 6th to the 8th standard, the child is forever deprived of that kind of knowledge about Europe which only school drilling can give. Secondly, they lower the school-leaving age. No child, however clever, should be permitted to embark upon life or the university or a professional career without some degree of maturity which comes with time alone. Instead of double promotions, an enriched curriculum is preferred. Class time can be used to expose the child to diversified experience by excursion to museums, factories, the printing press, newspaper offices, etc.

Scholastic ability is usually combined with ability in other fields. To draw out other talents, extra-curricular activities must create opportunities for an all-rounded development. Children could engage in debates and discussion on current events and world affairs, do small experiments in science, participate in clubs and societies for dramatics, art, music, games, and athletics and spend time in the arts and crafts rooms. From this variety the child is sure to pick up something suited to his specific ability.

Well-equipped laboratories and libraries are very essential. Everything should be done to enrich the child's independent reading, to help him form habits of thinking, and silent communion of the mind with the best that has been thought and written on every important subject. The influence on the mind and imagination of the child through reading can be very penetrating and lasting. A single great book can transform his life and personality. Attractive and well-bound books in the open-stack system, and guidance from experienced librarians and book-lovers to help the child to select reading material will go a long way to supply the needs of the gifted child.

In giving wide scope to all these potentials of a child, the teacher and the parent need to work in sympathy and cooperation. Favourable and well-informed parental and teacher attitudes to the pupil and recognition of his specific contribution in school and at home will vastly affect the total contribution of the child to the setting around him.

In a democracy, gregariousness, conformity and loyalty are valued above originality and freedom of the intellect. Submission to the tyranny of the unthinking majority and concern for material goals and economic competition can hinder the attainment of excellence. The urge for intellectual and artistic creativity is thwarted by lack of opportunities and appreciation and mediocrity results. If education is a process of the development of each boy and girl according to his unique ability and need, if the philosophical aim of life is the attainment of the good life, special educational provisions should be made to cover the rueful neglect of the superior pupil. In addition, conditions must be created for developing a stable personality with desirable character traits, such as integrity, respect for the right and for feelings of others, regard for the common good, intelligent and fair attitudes to art, literature, science and pastimes. Above all, the child must be impressed with the responsibility of using his special powers for the benefit of society so that the highest talent is devoted to the creation of progressive and enlightened civilization.

Recommendations

Drastic and bold measures are called for.

1. The Union Education Ministry should, forthwith, establish a National Commission on talented children with an imaginative Plato-like visionary educator as its chairman and give to the Commission, importance and powers comparable to those enjoyed by the University Grants Commission. Some enterprising citizens might also form an Indian Association for Gifted Children on the model of the American Association for Gifted Children founded in 1946, to enlist public interest and sympathy.
2. The Commission should, then, initiate a series of Five-year Plans to identify and provide for the needs of the superior pupils, either through special schools, perhaps three or four to begin with, in different parts of India to serve all sections or by selecting a few of the existing schools to arrange for special programme and separate classes for the gifted. During the first five years an earnest search should be made for teachers with high general intelligence, resourcefulness, sense of social responsibility and above all enthusiasm. Such teachers might receive short refresher courses in handling the child. For the experimental period, short courses combined with quick intelligence would ensure greater flexibility than highly specialized and prolonged training.

   During the same first five years, a vigilant eye must be kept to spot out children with special aptitudes. By the time the first experimental school is ready, say by 1969, these children should be around about 10 years of age and after six years of either special schooling or schooling through special classes and enriched programme, they should graduate at the age of 16 or 17 and be released to any university or vocational or professional training. Thereafter, it would be fairly safe to leave them to whatever the country offers and to their own initiative and pursuit of aim in life. The rest of us would then wait hopefully and see how these pupils assume positions of importance in the different fields for which they are specially talented.

   In the meantime the Commission might engage in publicity and send periodically questionniares to all secondary schools for relevant material on this subject. The questionnaire might solicit data on the following:

(1) Have you spotted any superior pupils?
(2) What is the percentage of these?
(3) What provisions are you making for them in your school?
(4) What is the main problem relating to the child of superior mental ability?
(5) Have you found any with special talent in science or art or social leadership?

Further, free discussion in the Press by prominent educators to give opinion and advice would be most valuable. It is necessary to explore views on, as well as methods of, tackling the gifted child in the Indian educational scene. The subject is controversial and many in the country would not favour special privileges for the few. A leading daily of U.P. recently picked out the Indian public schools, notably the Mayo, for caustic criticism. It would be interesting to see where the new concept recommended in this paper is different from that of the old Public School.

3. The last and the most daunting matter is related to funds. In a National Emergency it is unrealistic to expect the State to supply the budget for any extra item. The following are a few suggestions:

(1) The big industrial concerns in the country might be approached for endowments. Our Tatas and Birlas can rise to some small percentage of what the Rockfellers and Fords do. For instance, the Lady Tata Memorial Trust announced only recently the offer of six scholarsips of Rs 250 each per month for the year 1963-64 for research in medicine and Science. The prospect is encouraging if we can fire the imagination of money magnates, who have shown public-spiritedness already.

(2) As part of the ten-year-old UNESCO-sponsored associated schools projects for education in international understanding in which nine secondary schools and 11 teacher training colleges were intially participating, the Indian National Commission for Cooperation with UNESCO has started, for the school year 1963-64, a new programme in selected educational institutions to inculcate in children an understanding of and loyalty to the ideals of democracy enshrined in the Constitution. The interest of the Indian National Commission, should be invited for a special programme for the gifted along similar lines.

(3) Also, perhaps 10 per cent of the funds allotted to the U.G.C. might be diverted to this branch of education, since in the long run it is the superior secondary school pupil who will help to raise the standard of university education in such deplorable condition today. If the gifted child is believed to be important for the progress and enlightenment of the country, funds will be found.

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4

HEALTH EDUCATION IN SECONDARY SCHOOLS

CAPT. A. S. JAYANANDAM

THE DEFINITION of health in school progromme should be positive dynamic: a concept that regards health as a state of complete physical, mental, emotional and moral well-being and not merely the absence of disease or infirmity.

Health is a precious possession. People in bad health cannot work or study well. An unhealthy person cannot fully enjoy his recreation and he is not happy in his relationship with other people. As an unhealthy person is neither happy nor efficient, so a nation whose citizens are not healthy cannot be efficient and happy. Secondary school children are the citizens of tomorrow and so, their school should fit them to be happy and efficient future citizens. Scientists believe that many a great civilization declined because the health of the people was injured by disease, lack of food or bad living habits such as profligacy, vice, etc.

There are certain obstacles to health. One can only partially protect himself against diseases such as common cold and influenza. What use is there in talking of proper and nourishing food to a person who lacks the money to buy them. Observance of simple principles makes a person do much to guard his health and make the best of it for the future.

The human body is, in many respects, like a machine and needs good care and fuel, if it is to run well. The body can protect itself against many illnesses. When we are healthy, we never worry ourselves and we do worry when we are not well. Actually, the proper time when we should think of our health is, when we feel well.

Good health is the product of many factors such as heredity, home environment. nutrition, personal attitudes, intelligence, information, economic status, public health services, and standard and availability of medical care. Health hazards are numerous such as ignorance and superstition, neglect of proper care, malnutrition as well as diseases, accidents and injuries.

Health Education

Health Education should be such as would create and maintain those conditions, experiences and opportunities that will enable each individual connected with the school to do his best work with the maximum satisfaction and enjoyment to himself and to society during both the school and post-school life. Health education involves learning experiences by which children in various school situations grow in health knowledge, attitudes and practices. The instruction may be direct or integrated. Health education should be such as would make the child learn the scientific basis for correct living as related to nutrition, clothing, exercise, rest, cleanliness, immunization, first aid, safety, sanitation, personality growth and integration and desirable social habits.

The aims of health education are:

1. To instruct school children and young people, so that they may conserve and improve their own health and thus be more able to secure that abundant vigour and vitality which are the foundation for the greatest possible happiness and service in personal, family and community life.

2. To promote satisfactory understanding, attitudes and ways of behaviour among pupils' parents and other adults so that they may maintain and improve the health of the home and community.

3. To improve the individual and community life of the future; to work towards a better second generation and a still better third generation. to build a healthier and fitter nation and world. Therefore, health education calls for studies and activities together with environmental conditions as will enable the realization of these aims: a complete programme whicl influence every condition, situation and experience in the operation of the

school, whether in the classroom, auditorium, laboratory or playground. The programme must be comprehensive in scope and practicable in its application.

The Scope of Health Education

FOOD: It is one of the basic human needs. One should eat enough of food and also the right kind of food. Scientists assess the health of nations by what their people eat of the right kinds of food and the adequacy of the quantity. Food is probably the most important single factor to keep ourselves healthy. Foods called carbohydrates are found in bread, potatoes and cereals. They give us energy. Foods called proteins are found in meat, beans and peas. They are needed to build one's muscle. Fats provide us with energy. Minerals such as calcium, found in milk, are needed to build bones. Other minerals such as iron, give us rich healthy blood. Substances called vitamins, found in most natural foods, are needed to protect us against many diseases. Every one should eat enough of right kinds of food every day. Eating only one kind of food such as cawly is dangerous because many other elements found in other foods, are not taken into the body.

Bad diet comes from ignorance, poor food habits and poor distribution or actual lack of food. Many suffer from malnutrition as they do not eat enough food or enough of right foods. Poor people eat too much of wrong foods because they are cheap and filling.

Children who do not get enough food do not grow well. They stay small and scrawny and catch diseases easily. Over-eating of rich foods is as bad for health as not eating enough. People who eat too much become fat. Too much of fat puts a strain on the whole mechanism of the body.

As most of our secondary school boys are not rich enough to buy costly but nutritious foods, it is necessary as a part of health education to provide them with full information about very nutritious but cheap foods. Nutritional surveys conducted throughout the different states of India have proved beyond doubt that malnutrition is widespread in both rural and urban areas. Ragi and ragi malt, a cheap and yet nutritious food, will help to solve this problem to some extent.

THE CHEMICAL COMPOSITION OF RAGI MALT IS AS FOLLOWS:

(Values per 100 grams)

Protein gms.	6.2	Iron mgm.	2.5
Fat gms.	1.2	Vit B1 mgm.	0.36
Carbohydrates gms.	79.2	Vit B2 mgm.	0.11
Calcium „	0.28	Nicotinic acid	1.8
Phosphorus „	0.32		

(Taken from *Herald of Health*, January, 1963).

The importance of any food stuff depends upon its biological value. The biological value of ragi is very high. It stands second in the list, the first being whole egg.

Fresh Air: It is essential to life and well-being. People who live and work outdoors breathe plenty of fresh air. Rooms become stuffy because not enough fresh air circulates. In such circumstances people become less efficient. They suffer from headache and feel sluggish. Proper ventilation insures a constant supply of fresh air.

I may just make a mention of air conditioning though it does not concern our schools in India at present. Air conditioning helps to improve indoor air. It warms and moistens the air in winter and cools and dries it in summer. Dry air dries out the lining of the nose and makes it easier for people to take cold. Air conditioning tends to overcome this defect. It also helps to prevent heat exhaustion.

Clothing: The main purpose is to protect the body from cold, the sun and the rain. Clothing plays a large part in keeping us healthy. Sometimes fashion has violated the rules of health. To have tiny waist, women wore tight corsets which interfered with breathing and pushed organs of the body out of place. Foot-binding made Chinese women cripples. Modern trend is towards loose, light clothes to give the body air and freedom of movement. Right kind of shoes is essential: too tight or that which do not fit well make people feel uncomfortable. They also affect the posture. Warm clothing in winter and light clothing in summer protect health and are better than too much or too little clothing.

Housing: Housing protects body like clothing from exposure to cold, wet, heat and wind. Houses are healthful places to live, if kept clean and properly heated and aired. Vacuum cleaner is good to keep houses clean but many people do not have these modern inventions.

Doctors believe that each person should have a minimum of living space, then he will have adequate ventilation. Crowding many people into a small indoor space increases the danger of the spread of diseases. Bad housing makes people more susceptible to disease than those with adequate living space. One of the major social problems of the present day is to provide adequate and clean living space for all citizens.

Sleep: No machine can run constantly without becoming worn out more quickly than if it were occasionally permitted a rest. The human body needs an adequate amount of sleep daily according to the age and health of the individual. Growing boys and girls need more sleep than adults, not only to repair their bodies but also to help growth. Many believe that eight hours of sleep are essential for an adult. The individual's need varies; some need more and others less.

Cleanliness: This is essential to good health. Dirt and refuse of all sorts are fertile breeding place for germs. Even in advanced countries, there is a lack of adequate facilities for keeping perfectly clean.

Cleanliness is of two kinds: (1) Personal cleanliness must be taken care of by every individual. Personal cleanliness includes keeping hands and rest of the body clean and washed. School boys and girls should be made to keep their finger nails free from dirt. Hands should be washed before each meal because germs can enter the body when food is eaten. Washing keeps the skin healthy by preventing infection. Special attention should be paid to keep scalp and nails clean. Clothing should be cleaned often to prevent germs from accumulating on it.

2. Our surroundings must also be kept clean. Flies which carry germs breed rapidly in garbage. Sewage also contains many germs which cause disease. There must be certain proper methods of disposing of both garbage and sewage. Certain cities are covered all winter by smoke. Smoke cuts off health-giving ultra violet rays from the sun and helps to increase diseases of the lungs and respiratory system. Smoke causes soot which makes homes and workplaces dingy and dirty.

POSTURE: Good posture makes a person look his best. It helps also to keep the organs of the body in their proper position ensuring more efficient work. Bad postures make the organs of chest and abdomen sag. This puts the weight of those organs on muscles which tire easily. The lungs cannot breathe enough air and organs of our digestive system cannot move the food efficiently through the body.

It is easy to test one's posture. Stand up against a wall with heels touching the base board. Your head should be touching the wall, your shoulders, calves and hips should also touch the wall. The shoulders should be carried well back and not sagging forward. The head should be held erect but the neck should not be strained. Good posture can be achieved without stiffness.

It is important to keep the trunk erect when sitting or when standing. Poor posture at work with the body humped over a desk tires the muscles and lessens efficiency.

SAFETY: Modern man has made many machines to make work easier but they may be also dangerous. Accidents at home injure or kill, e.g., fall. Accidents in industry do the same. Many persons are killed or injured in recreations such as hunting, fishing and swimming. Rules of Safety should be observed to avoid such accidents. Care is necessary in crossing streets and in riding bicycles. Dangerous medicines should not be left within the reach of small children. Toys should not be left on stairs lest people should trip over them.

WORK AND PLAY: These are two important things that affect our health. If people work very hard, tire themselves their bodies cannot fight off disease germs. But physical inactivity is not good for health. Every one needs some physical exercise. After the age of 40 exercise should not be violent. Walking and gardening are two forms of inexpensive exercises for school boys and girls which can be continued throughout life. Exercise is best performed in the open air. This permits the body to get the benefits of fresh air and a healthful amount of sunshine.

Play may be mental as well as physical. Listening to the radio, going to the theatre and playing games of various sorts are ways in which mind and body can relax.

PROTECTION AGAINST DISEASE: Right diet protects a person from diseases which result from bad food, e.g., scurvy. Rest and exercise too protect a person against disease. There are a number of infectious diseases and the boys and girls should be immunized against such, e.g., diphtheria, small-pox, typhoid, T.B., measles, whooping cough, chicken-pox, influenza, etc. Quarantine should be used to prevent spreading of diseases among children. Diphtheria and small-pox have almost disappeared in certain advanced countries as the medical science has discovered special ways to protect people from them.

SMOKING HABIT: Special mention has to be made about this habit because many secondary school boys take to smoking being quite unaware of the results. I can do no better than inviting attention to some of the extracts taken from the *Herald of Health* of January, 1963, "Tobacco smoke contains not less than 19 poisons such as nicotine, ammonia, carbonmonoxide, carbolic acid, marsh gas, formic aldehyde, prussic acid, etc." Thomas A. Edison, the greatest electrical genius once declared, "Cigarette smoke has a violent action on the nerve centres producing a degeneration of the cells of the brain which is rapid among boys: Unlike most narcotics this degeneration is permanent and uncontrollable. I would rather see a boy with a revolver than a cigarette. I employ no person who smokes cigarettes."

Dr. A. C. Clinton of San Francisco, a physician for several boys' schools, stated: "A good deal has been said about the evils of cigarette smoking but one half the truth has never been told. Cigarette smoking first blunts the whole moral nature. It first stimulates and then stupifies the nerves. It sends boys into consumption. It gives them enlargement of the heart and it sends them to the insane asylum. I am often called in to prescribe for boys for palpitation of the heart. In nine cases out of ten, this is caused by the cigarette habit. I have seen bright boys turned into dunces and straight-forward honest boys made into cowards by cigarette smoking. I am speaking the truth that nearly every physician and nearly every teacher knows."

Note—All the factors mentioned above should necessarily go into any scheme of health education. The scheme should necessarily deal with each factor in respect of the individual, the school, the home and community.

The fields of health education which a secondary school youth should acquire is succinctly given below in another pattern or scheme:

Part I. (A) Human body, (B) Health maintenance and improvement, (C) Food, (D) Rest and exercise, (E) Personality, (F) Personal appearance, (G) Mental hygiene, (H) Family life, (I) Alcohol and Tobacco, (J) Disease, (K) Accidents, (L) Public health.

Part II. (1) Health needs, interests and beliefs, (2) Growth in weight and height, (3) Eating, (4) Elimination, (5) Exercise and play, (6) Sleep and Rest, (7) Eyes and Ears, (8) Teeth, (9) Posture, (10) Illness and disease, (11) Accidents and injuries, (12) Emotional adjustments, (13) Sex adjustment.

Part III. Interests and adjustments in respect of home, school and community.

1) Family life—emotional attitudes, understanding of social forces, maturity, reproduction, embryonic development, heredity, and ductless glands.

2) Safety education as a unit of Health education: Personal safety, first aid, community safety, industrial safety, fire prevention and home safety. First aid and other types of safety fire, sprained ankle.

Co-ordination with other individuals, Groups and Agencies

For the successful working out of a scheme of health education it is incumbent upon the school authorities to co-ordinate their efforts with other outside agencies and individuals.

a) There is a segment of the health scheme which is directed and carried out by experts in the line such as physicians, nurses and health officers in their individual or collective capacity. That portion of the scheme is based on the knowledge and skill of the medical and dental professions. Professional health workers and physicians have to cooperate with school principals and teachers. Active support of the physicians is required for the health scheme because pupils with health irregularities have to be referred to them for guidance and counselling.

b) Maintenance of a healthful environment is a necessity so, conditions that promote mental and emotional health should be ensured. To create such an environment the following should be resorted to: The health of teachers, the control of communicable diseases, elimination of causes of accidents, avoidance of conditions harmful to health and the use of teaching methods which do not cause undue anxiety or fear. The school should cooperate with the other groups which promote community's health resources.

c) A broad and functional programme of health education is a basic requirement. Each individual pupil in the school should know something about health by active participation in health activities connected with the school and its surroundings and the school is responsible for his opportunity to learn it. During the school period, every pupil should have good physical and mental health. He should know how to avoid illness and accidents and to protect the health of others. He must understand the difference between adequate and inadequate diet, the effect of drugs and stimulants and the value of immunization.

A school boy is exposed to the danger of moving with uninformed individuals, to learn wrong things from certain radio talks and to information in newspapers, magazines, books, motion pictures, etc. So unless he has correct information he may be misled. It is the duty of the school to teach him how to distinguish between misinformation such as superstitious beliefs, folklore, sales talk, etc., and the truth.

d) Junior Red Cross Group, if started, in a school will be an asset to the school as health and promotion of health is one of the fundamental aims of such a group. The State Branch of the Indian Red Cross Society, will do all in their power to supply all kinds of materials, charts, slides, booklets, posters, films, and projector on loan and freely to the J.R.C. Group. They also arrange lectures, demonstrations, exhibitions, etc., on health whenever it is possible to do so. So, any school which starts a J.R.C. Group will derive immense benefit from the Red Cross Society in promoting health.

e) The Nature Cure Association will surely extend its hand of co-operation and help to any school which gives it an opportunity to teach its principles and practice to the school boys and girls. In a poor country like India, the school authorities should see that their pupils learn all they can in the field of nature cure. Nature cure is simple, inexpensive and readily available for one and all. The Nature Cure Association will spare no pains to teach school boys and girls, the natural treatment by talks and demonstrations as and when the school authorities offer them opportunities for such free service.

f) The Government Health Department is one of the agencies to which school authorities can look to, for all kinds of help, advice, information and pertinent literature in working out their scheme of health education. Retired officers as well as those in service of the department will not fail to give all possible assistance to schools in matters of health. The Government can be approached by the school authorities for lectures, demonstrations, films shows, etc., by the officers of the department, especially, during the times of epidemics and spread of other diseases.

g) There are a number of *vyayama mandals* and massage centres scattered all over the country. By treatment of simple exercises and massage dislocations, nerve catches, etc., have been got over in these groups. The treatment is given free to one and all. School authorities can indent upon their help in teaching and demonstrating simple kinds of treatment. These practices have a scientific basis and have come down to us from the past. It is necessary to give all possible opportunities to school boys and girls to learn all these kinds of healthful treatment.

Teaching of Health Education in Secondary Schools

Our country is not a welfare state and so, we can conceive of three ways in which health education can be imparted in our schools.

Health education may be made a part of school curriculum and in such a case provision has to be made for the appointment of a health teacher or health assistant to teach the subject in accordance with the syllabus laid down. In that case the teaching would cover the whole school course. In such a case the health teacher should have special preparation in biological, physical and social sciences. His work should include the study of adolescent growth and development, school hygiene, secondary school organization, home and family life problems, methods of health teaching and specific courses in health field. There has been a growing recognition of the fact that nutrition is basic to health and so, a health teacher should be a nutritionist.

Health education is full of opportunities for counselling and guidance and so, a health teacher needs to have a keen interest in the age level. Only well-poised, emotionally stable and physically healthy individuals can work successfully as health teachers.

Secondly, knowledge of health may be imparted in special health classes and through other subjects but not necessarily through systematic health teaching. The success of health education in such circumstances depends greatly on careful coordination and planning. Each member of the school personnel should be a positive force in health education. A high degree of coordination is essential, if all the areas of health education are to be integrated.

SECONDARY SCHOOL HEALTH COUNCIL: This may serve as agency of coordination. It can also serve as a clearing house for problems. Health education can be woven into the day's programme of work or be stressed at certain times a day according to that day's plans. Pertinent health experiences can be given incidentally in each class by teacher. In a secondary school one teacher may teach several subjects or he may be well prepared for one or two only.

Almost all the subjects taught in a secondary school lend themselves in imparting health education directly or indirectly and so, all possible opportunities should be availed of, by the teachers of the school in that respect. Some of the subjects which easily lend themselves to health teaching are: (a) General Science, (b) Home Economics, (c) Domestic Science, (d) Biology, (e) Physical Education, (f) Social Science (Social Studies), etc.

Only a few points under each of the subjects are mentioned below:

General Science: For example, the following topics offer opportunities for both direct and indirect health teaching air, heat, water, distillation, light, sound, bacteria and food.

Home Economics: In this subject teachers have many obvious opportunities to correlate health teaching with their work. Emotional stability which increases with the feeling of security can be developed in classes in home economics where social problems and economic problems are laid open, candidly discussed and carefully evaluated. As a student of social pathology and criminology, I can easily deal with elements of delinquency and crime in this subject.

Domestic Science: Among others two most important health units which can be well taught in the domestic science classes are cleanliness of the home and nutrition. These are basic to health. The development of good nutrition practices is the responsibility of each and every teacher.

Biology: This is a rich field for health units—for understanding, information and attitudes concerning health. The main units are: (1) Basic process of digestion, circulation reproduction, respiration, assimilation, excretion, sensory stimulation and muscular response. (2) Human development and phenomena of growth. (3) Adaptation of organisms to their environment, biological facts in modern city and town environment, e.g., lack of sunshine, fresh air and space for muscular activity. (4) The relation of man to microscopic organisms. (5) Control and prevention of many diseases. (6) Study of man's nervous and endocrine systems and their interdependence.

Physical Education: Physical education though it has its own objectives serves the same purposes as health education and should operate in close cooperation with it. The physical education teacher should certainly seize the excellent opportunities offered for incidental health teaching. In the physical education, we have special health units on problems such as cleanliness, posture, social behaviour, the physical instructor should enable the pupils apply their health knowledge whenever they have an opportunity. It is important in the physical education programme to protect pupils from strain, excesses and abuses.

Social Science: This is a subject which runs through the entire curriculum and health learnings in social science and tied up with concept of health including human relations and ability to understand and adjust to one's environment. In the teaching of social studies, it is easy to touch upon important factors of health while describing the lives of great historical personages. History is replete with lives of great men with their noble and healthful habits. We do come across with lives of dissipation that some led and how they came to ruin due to their unhealthful living habits.

When the subject of health education is not a part of the school curriculum but only taught incidentally during the course of teaching of other subjects, it is necessary that a programme of health teaching is maintained to see whether the important health units are covered. One of the teachers may act as a coordinator in this respect for one or more school terms. In such circumstances a high school health council may be formed with representatives from amongst: Administrators, teachers, parents, health department personnel and physical education department.

The third method of health education is the initial stage of the introduction of health teaching in a secondary school. This period is only preparatory to the intensive teaching of health in a school. During this period, the staff of the school is appraised of the work ahead, their responsibility to impart health education during their subject treatment until a special health teacher is appointed. The starting of a Junior Red Cross Group in a school will help a good deal in this initial stage and the help of outside agencies may be sought in all possible ways through lecture and demonstration out of school hours to promote health knowledge.

I presume that most of our schools are in this stage as regards health education.

During the initial stage of health education, the pupils of a school should be made to sudy healthful school environment. They should know about their school, beginning with the healthful physical environment such as the school site, suitable location, transportation facilities, trends in population movements, nearness to places of heavy traffic and bustle of town life. The school building often tells of the health and safety. The school environment shall be safe, sanitary, comfortable, attractive and functional.

In the case of welfare states, health education is an easy affair because the National Health Department will do everything that a school requires. The school will of course maintain only the medical inspection reports, health inventories and statistics in regard to sickness, accidents and injuries of the pupils and teachers. The National Health Department will appoint school health administrators, physicians, dental hygienists, psychiatrists, psychologists, nurses, etc., for the purposes of health appraisal and counselling. Complete treatment, quarantine and immunization will be undertaken by the National Health Services.

ed from any contact with pupils or school staff, playground, etc. As regards non-physical environment, there are a few points of the organization of the social programme. The classroom is a laboratory in which there is an interplay of all forces which are found in adult life—physical, mental, moral and social. The teacher should guide the pupils in such a way as to help them to form habits, attitudes and reactions which result in harmonious living and contribute to the health of the school. What is taught affects a child's feelings and emotional development as well as his intellect. Work assigned should be such that the pupil sees and feels the significance of the work. School should provide such experiences known to contribute to wholesome emotional development.

MENTAL HEALTH AND PHYSICAL HEALTH : In dealing with health education, it is necessary to mention a few points about the relationship between mental health and the physical health. The body cannot begin life until it first begins to generate magnetism. Every particle of the human body is charged with latent magnetism. There are certain proper foods which give magnetic health while the improper foods destroy magnetic health. Almonds, almond coffee, apples, arrowroot, artichoke (vegetable of light nutrition), bread (not new), butter, milk, dates, eggs, and figs are proper foods.

It is recognized that a proper development of the body and sound bodily health depend upon the maintenance of good hygienic conditions but the fact that there is a need for careful mental hygiene is not well appreciated. The influence of bodily health on mental health is recognized. Mental energy is not inexhaustible and much harm is due to forgetting this fact. Overwork may leave wounds in the mental constitution that are not easily healed. An excess of mental work, of worry and of excitement, especially, when combined with an insufficiency of sleep, is likely to be followed by signs of brain fatigue, restlessness, insomnia, inability to concentrate on intellectual work and so on. Alcoholic excesses, abuse of tobacco, and coffee precipitate the onset of brain fag. Rest and the adoption of sound hygienic habits form an essential part of any treatment.

Many people complain of their health when actually they have no physical disease. There is something disturbing their minds and so they suffer from mental conflicts. Cultivation of a calm and confident state of mind is necessary to avoid such disease with no physical cause. Doctors have found that there is relationship between our personalities and diseases. Again, certain diseases also affect personalities, e.g., certain types of heart diseases make people irritable. Battles have been lost because generals were in bad health and could not make right decisions quickly.

METHODS OF TEACHING: Learning by doing is more important in health education. Student initiative and participation in all activities in school and outside the school should be encouraged. Sometimes they may be made to plan out their own schemes for execution and it would go a long way to increase their interest in the work.

The following methods are suggested:

- —Discussion: In small groups under the guidance of teachers or under student leaders.
- —Social dramas by students to bring out certain important points of health.
- —Problem-solving activities: Student initiative and self-direction.
- —Audio-visual instruction: Graphs, charts, posters, slides, motion pictures, radio, television, etc., if possible.
  Charts and graphs can be prepared by the pupils under the guidance of teachers.
- —Lectures and demonstration: Laboratory demonstrations, enlistment of the help of physicians, nurses, dentists, oculists, psychologists, psychiatrists, health officers, educationists, social workers, representatives of various agencies such as the Red Cross, *Vyayama mandals*, Nature Cure Association, etc., and other qualified persons.
- —Teacher's example is very effective in the mater of health education.
- —Individual conference is also a very effective method of teaching.
- —Tests of various kinds to gauge the pupils' interest, knowledge, habits and attitudes, individual tests and group tests in competition.
- —Excursions, trips and visits: Sanitation of a dairy, water plant, different institutions, factories, etc.
- —Teaching under student leadership, simple breathing exercises, *yogasanas*, *suryanamaskarams*, etc., etc.,
- —TEACHING AIDS: These make teaching very effective.
- —Textbooks.
- —Library facilities.
- —Audio-visual aids of all kinds: Some to be made by students themselves.
- —School and community resources: Teachers of sciences and home economics, dentists, school, laboratories, social workers; other agencies and other community resources, hospitals, dairies, public health department, police and fire department, food industries, etc.

5

EDUCATION OF GIFTED PUPILS

N. L. PANDIT

HISTORY is full of the names of various men gifted in different lines, viz., government, sciences, literature, art, etc. If we look back upon the lives of these men, we find that they were endowed with high abilities in their early childhood. From an educational point of view the selection of the gifted has attracted the attention of great leaders. In ancient Greece, Plato advocated the use of a series of tests to discover the talented and to train them according to their superior ability. He believed that Greece would continue only as long as such a course was followed. Suleiman, the magnificent ruler of Ottoman Empire in the sixteenth century and Adolf Hitler in the twentieth century also worked successfully on these lines. Other nations today should take a learn from such practices and devote them to goals more acceptable to democratic living.

Definition of the Gifted Child

The advent of Binet Simon tests on intelligence measurement has brought about a revolution in the field of education in the modern times. The most important contribution of this movement has been the recognition and understanding of individual differences. The studies of Terman and Hollingworth have been illuminating. Terman regarded those children to be gifted whose I.Q. was above 130 which comes to about 1 per cent of the total school population. More recent estimates of the frequency of high I.Q. vary somewhat from the earlier findings.

This type of rigid classification on the basis of intelligence will naturally exclude those children whose ability in art, music and allied subjects may be very much above normal standards, because these potentialities can not be measured on the basis of intelligence tests, hence we should regard 'any child as potentially gifted whose performance in a valuable line of human activity is consistently remarkable'.[1]

Due to the current prevailing conditions, the needs of the gifted children are not adequately met despite their superior insight and adaptability. The result is that they are emotionally so much disturbed that they fail to adjust properly. When the gifted children fail to find proper satisfaction for their needs they are likely to resort to undesirable ways for meeting their needs.

Characteristics of the Gifted Child

There have been various popular misconceptions about the characteristics of the gifted children. A layman thinks that there must be compensations for most deviations in life. If the intellect in the gifted children is unusually high, physique, personality and other qualities must be low. while there are a few individuals of high ability who show these tendencies, the predominant trend is just the opposite and the gifted are well endowed in many fields.

Physical Development

In a study of the development of the gifted children, Mean[2] found that they learned to walk about one half month earlier than the average and talked about three months earlier. Terman[3] in his book *Genetic Studies of the Genius* has written that these children are generally superior to all other groups in practically all the physical traits. All the studies of the gifted point

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1. Spinner, Charls, *Essentials of educational Phychology*, Asia Publishing House, Bombay, 1960, 148pp.
2. Mean, C. D., *The Relations of General Intelligence to certain Physical Traits*, Columbia University Teachers College, New York, 1916, 117 pp.
3. Terman L. M., *Genetic Studies of Genius*, Vol. I, Stanford University Press, California, 1925, 648 pp.

conclusively to the fact that mentally gifted children are also superior in most physical characteristics as well.

Personality and Social Characteristics

As a group gifted children are superior to average children in practically all personality and social characteristics. Some times a few gifted children are known to have very selfish interests and make use of their unusual powers in their pursuit to the detriment of others; but generally the gifted represent very desirable factors. They seem to realize that they will promote more progress and goodwill by pleasant rather than by unpleasant ways. They are able to live in an abstract world in which they merge themselves and enjoy the drama of life around them instead of being absorbed in their own affairs.

Intelligence

The gifted children have mostly been selected on the basis of intelligence testing. In some cases the minimum I.Q. has been 130 points, while in others it has been 140. The upper range of I.Q. sometimes reaches 200. The mental age of gifted child is greater than his chronological age and this continues to grow in the same proportion. Their gain continues at the same rate so that by the time they are 15 years old, they attain the mental age of 20 years and some of the more advanced are even higher.

The number of cases of the gifted children is determined by the limits set in various plans of selection. If an I.Q. of 130 points is taken as the lower limit, then about 1 per cent of the total school population may be gifted. If the lower limit is 120 points, there may be gifted about 6 per cent of the gifted among that group. If about 5 per cent of the students are selected from every school having a few hundred students, the number will be enough to run one or more classes with special project. Again it has been noted in practically all types of exceptional children that the number of boys exceeds that of girls. In his study of the gifted children Terman found the ratio of gifted boys to girls to be 11: 10.

Causes and Background

Heredity is to a very great extent responsible for the presence of the gifted children. There is a preponderance of gifted children with parents above the general level of ability as measured by the occupational status of their father. According to Terman[4] 31.4 per cent of the gifted children had their fathers in the professional group and according to Cattell's[5] study 43.1 per cent of fathers were from that group. About half of Terman's group were from semi-professional and business group, 11.8 per cent skilled labour, 6.6 per cent from semi-skilled to slightly skilled labour and .13 per cent from common labour. Sir Francis Galton found that 977 eminent men had 533 relatives of equal eminence.

From the above it is clear that heredity plays a very important role in gifted children and adults. It is also evident that a substantial majority of gifted children come from homes of a professional or near professional status. These homes provide a favourable heredity as well as environment. Books, magazines, travel, friends, and associates all contribute to their culture and growth.

Difficulties of Gifted Children

Lonttit has very aptly enumerated the most frequent sources of difficulty in the adjustment of the gifted children. According to him the difficulties are:

—Lack of teacher's recognition of superiority leading to an antagonism towards the school as an institution.

—Lack of parental recognition of superiority resulting in positive discouragement and lack of stimulation.

—Superiority over available associates so marked that social adjustment is extemely difficult.

—Development of poor study or work habits because of lack of stimulation of classroom work.

—Development of inferiority feelings because the child's interests and activities are not socially recognized by the group.

—Development of a boastful, conceited personality because of unwise emphasis by adults.

—One-side personality development because of lack of normal social activities resulting from parental intervention.

Development of Suitable Programme for the Gifted

Society is quite negligent in detecting and conserving the talents of the gifted children. In many schools gifted children often spend their entire

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4. Terman, L. M., *Genetic Studies of Genius*, Vol. I Stanford University Press, Stanford University, California, 1925, 64pp.
5. Cettell, J. Mck, *American Meu of Science*, The Science Press, Lancaster, Pa, 4th Edition 1927, 1132 pp.
6. Quoted from Gates, A. I, and Associates, *Educational Psychology*, The Macmillan Company New York, Third edition, 1957, 722-723 pp.

school life without being detected and hence the question of taking particular interest in them does not arise. In other schools, group mental and educational tests are administered to all pupils, gifted children are identified but nothing is done to help them. In addition to educational apathy, economic factors also contribute their mite in not providing equal opportunity to all the gifted children. Prof. Goetsch[7] in one study found that 90 per cent of superior high school graduates from well-do-do families were attending college in contrast to less than 20 per cent from families with limited incomes.

The educational system should provide three kinds of adjustment to the gifted children. These are acceleration, segregation and enrichment.

ACCELERATION

In the absence of any other arrangement for the gifted children, they should either be double promoted or they should enter school at an earlier age so that they become accelerated ahead of the children of their own age. In order to achieve the objective of helping such pupils, it is essential to see that they are physically and socially mature, otherwise they will face problems of adjustment with the older boys of the higher class. The danger is that the gifted children may absorb the intellectual phases of subject-matter without much realization of their social, political and economic values. Terman and Oden in one study of the accelerated and the non-accelerated groups found that the risks of moderate acceleration were not as great as commonly believed.

SEGREGATION

Segregation consists in first finding out the gifted children from different classes and then treating them as one special group for a particular class. It may be the first section of every class that may have such gifted children. This automatically means a large school from which about 25 to 30 gifted children may be selected to form the special section in each class so as to make it economical. 'The city of Cleveland has one of the best organized systems of classes for the gifted which has functioned successfully for more than thirty years'.[8] Cleveland's experience has been that the theoretical arguments against such classes do not materialize in actual practice. Their pupils find many advantages due to their associations with classmates of similar mental and social interests in an atmosphere of freedom which is much more difficult to develop in a heterogeneous group.

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[7] Goetsch, H. B, *Parental Income and College opportunities;* Teachers College-Contributions to Education, No. 795, Columbia University Press, New York, 1940.

[8] Baker, H. J, *Interoduction to Exceptional Children* Revised edition, the Macmillan Company, New York, 1957, 291 pp.

The provisions of different curriculum at the high school stage leads to segregation to some extent in so far as it gives an opportunity to students to select subjects of their own choice. But even here the opportunity is not utilized in the best possible way due to the parent's ambitions. Again, even in these groups based on curriculum there are individual differences and hence there are gifted children who need special attention.

ENRICHMENT

Enrichment provides many oportunities to the gifted children without some of the possible disadvantages of acceleration or segregation. This consists in providing suplementary assignments and additional materials for helping the gifted. Before doing this, the teacher should ascertain the educational attainments of each gifted child and then offer him an opportunity for educational endeavour at his level. It will not do to provide for the gifted child any haphazard amount of work of the kind offered to children of higher classes.

The field of free reading offers an unusual opportunity for enriching the experiences of the gifted children. Terman's[9] study shows a continuous increase in the amount of reading as the gifted child matures. The height of the reading craze which occurs for an average child at the age of 13 years seems not to have been reached at 17½ years of age in case of the gifted[10]. But such pupils need proper guidance. To become independent and resourceful in finding and reading books, they need both direction and encouragement. Hence the teacher of the gifted children must acquaint himself with children's literature so that he may be able to help the gifted children find appropriate reading material to satisfy, extend and enrich their interests. Not only this, but the teacher should attempt to associate reading experience with the developmental needs of the gifted pupils. If reading is used in association with other activities, it may foster desirable growth. The reading should provide to the gifted child a wealth of good material—realistic fiction, animal stories, biographies, poetry, factual information, etc.

Different creative activities have also the capacity to provide sufficient enrichment to the gifted child. The field of writing and languages can also provide excellent opportunities to the gifted child.

Since gifted children lead lives filled with a great variety of interests, enrichment is a practical avenue of approach to it; but it is essential to place some reasonable limits upon enrichment so that the gifted children may not overwork themselves due to the great interest they find in the additional material.

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[9] Skinner, C. E. *Educational Psychology*, Third Edition, Staples Press Limited, London, 1925 188 pp.

The programme of acceleration, segregation and enrichment may be practised in isolation or in various combinations. There may be acceleration with segregation, acceleration with enrichment, segregation with enrichment or all the three may be practised together. There are unlimited possibilities for research in these many types of adjustment programmes for the gifted children.

Conditions in India

Conditions regarding the programme of the gifted children in our country are the worst. In the field of education we are so backward that we have not even cared to spot the gifted children in the schools. Many a time the gifted children spend their entire life in school without being detected, nor is any particular interest taken in them. If some schools administer some tests and find out the gifted children, they fail to provide any follow-up programme for such pupils. Our schools cater more for the students in the average and lower grades of intelligence than for those in superior grades. We are interested more in the quantity of the result than in its quality.

Suggestions for the Education of the Gifted in Indian Schools

Keeping in view the conditions as they are and knowing full well the potentialities of the gifted children, I may venture to make the following suggestions for remedying the handicaps of these children:

1. In every secondary school, arrangements should be made for testing the children in order to find out the gifted among them.
2. If the school is having a large number of pupils, segregation of students in each class on the basis of giftedness should be accomplished, so as to make the problem of guidance to the gifted more effective. If the school is a small one, the gifted pupils should be helped to enrich their life with reading and other creative experiences
3. The poor and gifted students of the secondary schools in the towns of the district other than the district town, should be provided with maintenance scholarships to execute their studies in the district town school, where proper arrangements for the handling of the gifted pupils should be made.
4. The needy among the gifted pupils in every school should be provided with free education and books.

5. Training colleges for teachers should run special courses for the trainees in the art of the teaching and handling the gifted children. The trainees should undertake a lot of practical work in this direction so as to be able to spot the gifted child and to help him in developing to the best of his abilities.
6. Every secondary school should be provided with an adequate library having sufficient books on children literature in order that enrichment be provided to the gifted children.
7. Handling of the gifted children is a difficult job. It is, especially, so at the hands of untrained teachers. If arrangements at the divisional or state level to provide postal guidance to the teachers guiding the gifted be made, it may go a long way in the education of the gifted pupils.

Conclusion

Looking to the needs of the nation and the important contribution that the gifted children might make, if they are properly guided, it is very essential that immediate measures should be taken to implement the plan for educating the gifted pupils. In the resourcefulness of the gifted, there is promise for the conservation of human life and of the natural resources of the country. All the potential assets of the nation must be conserved. Neglect of the gifted has made them most severely handicapped of all the types of handicapped children. The handicaps from which they suffer can be remedied and the records to themselves and to society will be amply repaid.

6

TEACHING AND LEARNING OF HINDI

D. V. RAMA KRISHNA RAO

It is a matter for gratification that Hindi, the national language, has been made compulsory in all the states of South India. Hindi is almost a foreign language for the pupils of Andhra Pradesh. Besides this, it is an additional burden for them. Pupils in Andhra Pradesh have to learn Hindi compulsorily besides their mother tongue and English, whereas pupils of Hindi-speaking areas have to learn only their mother tongue (i.e. Hindi) and English. So, the teachers of Hindi have to endeavour much to lessen this additional burden.

Before dealing with the present topic, it will not be improper if a brief account is given about the adverse environment and complex circumstances under which the process of Hindi teaching is taking place.

Till now the Hindi syllabus has not been made perfect; textbooks in Hindi are not without defects; no books are available on the special methods of teaching Hindi useful both to the teacher and the taught in Andhra Pradesh; only two periods per week are allotted for teaching Hindi; furthermore, in the secondary schools, the low precentage of marks prescribed for a pass in Hindi, i.e., 15, brings down the status of Hindi in the eye of the students and their parents. Teachers of Hindi are not represented on the committee framing the syllabus for schools. It is unnecessary to mention that all these defects should be rectified so as to make the teaching and learning of Hindi successful.

The requisites of an ideal teacher — good behaviour, character, patience, sympathy and understanding, sweet tongue, self-confidence, zeal for teaching, versatility, thorough preparation, basic knowledge of child psychology, simple living and high thinking, definite outlook of life and a sense of discipline and punctuality etc.,—are all the more essential for a teacher of Hindi because his work load is very heavy and he has to face complex problems passing through a diversified curriculum. Much stress is, therefore, to be laid on impartiality, undaunted spirit, firm resolution against allurements, an impersonal and objective approach to teaching, the preference of example to precept, a sincere effort at understanding the background of the mistakes committed by the pupils and judging their actions in its light, etc.

It is in the hands of the Hindi teacher to lessen the additional burden on the pupils—even against the adverse current of the present circumstances.

It is necessary to commence teaching of the Devanagari script in the first from itself. In Andhra Pradesh, the teaching of Hindi commences in the first form, but according to the syllabus, it should be taught only orally at this stage. In the absence of the script, therefore, real teaching of Hindi starts in a way afresh from the second form.

Hindi is not entirely a foreign language like English for the pupils of Andhra Pradesh. It is 50 per cent foreign and 50 per cent native. It can be called a 'semi-foreign language'. There is similarity between Hindi and Telugu in the pronunciation of sounds as also in sentence structure. Sanskrit words are used profusely in both these languages. These similarities often create certain difficulties during the course of learning Hindi by the pupils. As a result of this, pupils commit certain common errors such as:

—Pronunciational errors
—Spelling mistakes
—Grammatical mistakes
—Structural errors
—Vernacularisms

Prevention is better than cure—according to this statement, it is essential to use proper teaching aids to make the teaching of Hindi more effective, interesting and successful. In this connection, it is to be noted that although no teaching aids are necessary in the Hindi speaking areas for teaching Hindi, which is their mother-tongue, but for teaching Hindi as a second language, the aids are essential. The Hindi teachers in Andhra Pradesh have to plan out and prepare the necessary teaching aids. Such teaching aids have immense use in the classroom.

How to make the Teaching of Hindi Effective and Successful with the Help of Teaching Aids ?

The success of the Direct Method entirely depends upon the teaching aids employed. The teaching aids not only lessen the burden of the teacher but also bestow the maximum possible knowledge in a minimum possible time in a permanent form upon the boys. We can associate the object and the word, idea and the word, action and the word, etc., directly by using these aids and make the lesson interesting and effective, and it can be imprinted upon the minds of the pupils in a permanent form. Proper atmosphere for the teaching of Hindi can also be established in the classroom. Some such teaching aids have been described below.

Flash Cards

Flash cards are of immense use while teaching new words in a language. The picture of a bird or an animal, etc., can be drawn on a card with the name written below or behind. We can teach number, gender, action words, etc., by having pictures of 'two mangoes' or 'two books' or 'two watches', 'bullock-cow', 'cock-hen'; and an eating, or a drinking, or a bathing boy or girl. All this can be impressed upon the minds of the pupils with the least effort if such an aid is used.

Wall Charts

Alphabet, numerals, number, gender, new words, imperative, and the forms of the tenses can be taught with the help of the wall charts. By using these wall charts we can indirectly inculcate among the pupils a habit for self study.

On a big card-board, the things to be taught will be written and hung in the classroom for somedays. After a fixed period, the chart hung in the classroom should be replaced by a new one.

Model Hand-writing Cards

It is essential to place correct, clear and beautiful form of letters in an ideal manner before the pupils. Besides the writing work upon the blackboard, if we write upon the cards and pass them on into the hands of the pupils, they will try to imitate the model hand-writing. Vowels, consonants, 'Barahkhadi' of two or three consonants may be written on separate cards. The multiple sounds may be written upon separate card.

Sentences containing morals, a story, a poem, etc., can be written upon separate cards. If we place the forms of sounds individually and in words or sentences in various sizes, the pupils shall understand and follow the model hand-writing.

Silent Order Cards

Sentences carrying orders may be written upon small cards (one on each) and shown in the lower forms. The pupils after seeing them, being pointed out by the teacher, carry out the orders one after one. The word that we like to impress upon the minds of the pupils should be written in dark colour. At first, the teacher reads out the order aloud, and points to the pupils. Afterwards, without reading, he may point out to the pupils so that they may carry out the orders.

In his connection, it will not be improper to mention the psychological relation between receptive ability and colour. By using the colours properly in the Teaching Aids, we can make the pupils learn the language within the shortest period with great interest.

Silent Question Cards

The method of using this aid and its purpose is the same as that of the silent order cards. We can show an actual object or the picture of an object like fruit, bird and point out to a pupil. Then he may be asked question about it.

While displaying the above silent question card, a pen or a book etc., or the flash cards containing some things inanimate or animate like mango, ship, parrot, etc., may be shown one after another.

We can achieve many more objectives by using these silent question cards. This can help in imparting working knowledge of Hindi to the pupils.

The answers to the above question are connected with the daily life of the pupils and as such they get them by heart without the least effort, and indirectly acquire working knowledge of Hindi.

There are certain usages in Hindi where students commit mistakes even after attaining the college stage. We can prevent them from committing those mistakes right from the lower classes.

If the answers of each of the above questions in the cards are elicited from each student of the class, he will be compelled to follow the correct usage.

The special advanage of the silent order card and the silent question cards is that the teacher shall have little necessity of talking. His energy shall be saved. Simultaneously, proper atmosphere for the teaching of Hindi shall prevail because of interest and activity in the class.

Picture Cards

A big sheet of Card Board can be taken and on the upper portion of it, a picture can be drawn. In the portion left below, some sentences with a single dash or double dash or some questions or a poem can be written, and on the reverse, suggested answers or hints for the substance of the poem should be written according to the need. All these picture cards can be graded in terms of standard for which they may be used.

These picture cards are very helpful while teaching new vocabulary or new structures. This also helps in testing the knowledge already acquired by pupils. In this way pupils do not feel tired and they do not even feel that they are going to be tested.

Pictures

While teaching a narrative incident or a story orally or making the pupils narrate, the pictures can be used. The picture of a garden or that prepared based on a story can be shown and questions put to the pupils. Pupils are naturally attracted by coloured pictures and they pay attention to the lesson. This aid inculcates the habit of thinking in them and their ability of free expression in Hindi is promoted.

Substitution Tables

These play a great part in giving a perfect knowledge of the sentence patterns in any language. The pupils can themselves proceed from 'Example to the Rule'. These substitution tables, besides imparting knowledge of new vocabularly, also serve the purpose of testing their acquired knowledge. These can be prepared in many forms.

In a thick sheet of paper two slits are made another thick paper adjusted in them. On the horizontal card, the important items of the structural pattern are written and upon the vertical one, the new words to be taught are written or their pictures drawn. Sometimes we have to place two vertical cards according to the need. This aid can also be prepared in a box. A big card can also be made into such an aid.

Sentence Building Cards

On small pieces of card-board of about 2"×1" dimensions, some nouns, verb-roots, auxiliary verbs, adverbs, prepositions etc., of Hindi language are written. These are placed before the pupils and they are given sentences in Telugu. They are asked to build up sentences in Hindi.

To frame the sentences in Hindi from the sentences given in Telugu, three, four or sometimes five cards are to be selected respectively. This is a playway method of teaching language. This is a game similar to the word building game. But word building in Hindi is difficult because 'Barahkhadi' and multiple sounds become obstacles in this process. So, it appeares to be good to write words upon the cards so that sentences may be built up. In the early stages of teaching Hindi, the use of this aid is very great.

By using the above teaching aids, the teaching of Hindi can be made quite successful. Radio, tape recorder, magic lantern, sound-film projector, epidiascope, can also be used occasionally. Among, these aids, the last three are very expensive and cannot be used commonly. Radio disturbs the neighbouring classes. So, these should be used properly. All the aids described above can also be used along with the epidiascope. This makes the lesson attractive, interesting and effective. It also answers tremendous success in the process of teaching Hindi.

How to make the Teaching of Hindi Effective and Successful Through Psychological Methods

If our behaviour towards others is to be proper and becoming, we should first of all have a thorough acquaintance with their psychology. This is true in case of children also. By knowing the mental standard, tastes and aims of each pupil, we can understand his mental structure. This helps in imparting proper education to him and in using such methods which bring the maximum mental development within the shortest possible time. Below are suggested a few methods which may be used according to the psychological needs of children. If this is properly done, it may bring good results.

Transcription work may be assigned and the books of the pupils who write at first may be corrected and the right of correcting the books of the remaining pupils may be given to them. Because of this procedure, they learn the alphabet, 'Barahkhadi', etc. We can derive much benefit by giving them this privilege and thus inculcate in them the spirit of competition.

The pupils may be given an opportunity to put question to other pupils based on the lesson taught. For example on the left side of the blackboard, pronouns may be written and on the right some verb-roots. One pupil may point out to one pronoun and one verb-root and ask another pupil to frame a sentence using that pronoun and that verb-root. Questions can be made more and more difficult. This produces a competition among pupils.

Brighter pupils of the class may be asked to help the dull ones and to try to raise their standard of language. This may be helpful in developing self-confidence and self-dependence among dull pupils.

Occasionally, we can ask the pupils of lower standards to give one by one the Hindi words or sentences that they know. This may help in developing that knowledge among pupils which are beyond the scope of the classroom. By this, the habit of self-study can also be developed in them.

Sometimes we can tell the most backward pupils in Hindi "I shall come to a cinema *along with you* when you get above 50 per cent in Hindi." The desire in the pupil to go to the cinema *along with the teacher*, when provoked, makes him strive hard so that he can improve his Hindi.

We can also raise the standard of Hindi of the pupils by entrusting to them the preparation of some of the above said teaching aids.

This can also be raised by conducting essay competitions (in higher standards) and thus promoting in the pupils a desire for reward.

In short, the various defects with regard to the number of periods, syllabus, marks required for a pass in Hindi, etc. are to be rectified. Meanwhile, adopting the psychological methods, by preparing the teaching aids during the summer holidays and by properly improving them in the classes the common errors can be prevented and the teaching of Hindi can be made interesting, effective and successful. All this can be done by a Hindi teacher provided he takes some pains.

> (The writer submits that during his teaching, he prepared the teaching aids as discussed in the paper improvided them and used the psychological methods of teaching mentioned above. He thinks that this experiment of teaching Hindi brought a grand success to raise the standard of Hindi language).

SCIENCES

PART II

7

BETTER SCIENCE EDUCATION THROUGH STUDENT WORK SHEETS

R. P. SHAH

DURING several years of active participation in the regional and state level workshops, the experimentor felt that new tools of education are needed to raise the standard of science education in the light of recent trends of evaluation.

The annual examination and the textbooks still remain the ends and means of science education respectively, for most of the schools. Textbooks mould the pattern of teaching and testing. It was felt that the compilation, try-out and publication of students' work-books, reference books, teachers' manuals, etc., could improve the teaching-learning situation to a great extent, and so it was decided to prepare student work sheets, try them out on an experimental basis and publish them for wider use.

The following objectives were kept in view while preparing the work sheets:

(a) The work sheets should enable the students to develop (i) skills and attitudes suitable to their stages of development, and (ii) good study-habits.

(b) The procedure evolved should not entail appreciable recurring expenditure on the part of the school and extra work hours for the teachers.

Procedure

In June 1960, two divisions of the class VIII were equated for achievement, age, sex and socio-economic background. Four circulars were issued to the students for orientation and parental cooperation.

(1) The first was addressed to the guardians to inform them about the purpose and procedure of the project. The role of the parents in the implementation of the programme was made clear.
(2) The next for the guardians was issued to them to observe and report the behavioural changes of their wards.
(3) The third was issued to the students informing them about the salient features of scientific methods and scientific attitude.
(4) The last was issued to the students informing them about the methods of self-study, suitable for class-work and home-work.

The above four papers were explained to the experimental class thoroughly. The class was split up in groups of four students each. The leaders of the groups were sponsored to collect problems and projects on the following units of syllabus:

The air we breathe,
The food we eat,
Our home and appliances,
Our health,
Food for the growing population.

Each unit was further divided into topics and sub-topics in the form of problems and projects, which were assigned to the students individually for general study and in groups for detailed study.

Some of the books of the school library and science club library were shifted to the class library for the time being, and arrangements were made to issue the books to the students.

The achievements of the experimental and controlled groups were compared at the end of every fourth month. The returns of the tests did not show appreciable differences for the first two tests. However, the third test gave the results recorded on next page.

The achievement of the experimental group was found to be higher on the basis of the tests, appraising the knowledge aspect of the educational outcome.

The textbooks, syllabus, test papers, teaching personnel, etc., were the same for both the groups.

	Experimental Group	Controlled Group	Critical Ratio
Mean Score	27	22	—
Standard Deviation	9.4	10.3	2.38
Number	44	44	—

The anecdotal records, reactions of the guardians and students clearly indicated the utility and suitability of the new approach. The following were some of the reactions:

Most of the students were coming to the class with advance preparation on the topic to be covered.

About 12 per cent of the student were found to be performing simple experiments at home.

The interest developed was so contagious that many students from the other divisions were found to be using the work sheets issued to the experimental class.

The questions and queries put in the school question box were from the experimental class in a majority of the cases.

Some of the guardians showed their willingness to come to the school to give talks on subjects related to the syllabus. Some of them invited the class to visit their factory or plant.

The students of the experimental class insisted on continuation of the project for the higher standard after the annual examination.

Some of the difficulties perceived during the project were as follows:

The approach is likely to be in disfavour with some of the lazy students, who are reluctant of self-help or who are used to spoon feeding in other subjects.

Rotational groups method is likely to be more suitable than parallel group method in such a project as aspects other than knowledge are also to be appraised.

The monthly syllabus is bound to be covered at different speeds for experimental and controlled groups because of the difference in approach. So results of the mid-term tests are not as useful as those of the annual tests.

Standardized achievement tests are not available in the market for initial and final comparisons. One of such tests was used. It yielded sharply bi-modal distribution for both the groups. Moreover, the test has only one form, so comparison was not possible.

The results of the pilot project were quite encouraging and interesting. However, these work sheets should be used in other school situations for try-out. And if results are consistantly encouraging more sheets for higher grades can be prepared and tried out in other schools, preferably, those situated in rural areas.

APPENDIX I

Science Experimental Class—VIII F

LETTER TO GUARDIANS

Your ward Shri................is a student of standard VIII F and that division is selected as an experimental group for working a science project, and so we take this opportunity to tell you something about it.

Aims of the Project

The experiment aims at creating proper atmosphere for teaching science in such a way that the following aims kept in view are fulfilled:

- To train pupils to solve problems in life in a scientific way.
- to inculcate the habit of looking at incidents in nature and society in a scientific way.
- to make the pupils rely not only on class work for getting enough knowledge but also to depend on the habit of self-study, experimentation, reading of extra allied science books and the habit of inquiring ones ownself.
- to inform the pupils about the vastness of the subject and also of the scope to do something worthwhile.
- to inculcate the habit of doing anything and everything in a proper scientific way.

Procedure

The content aims laid down by the department for the teaching of science will be kept in view and the teaching and evaluation will be arranged accordingly.

The first test will be given a weightage of 15 per cent and so also the second test. The third test will be given 50 per cent weightage while the remaining 20 per cent will be for the internal marking as laid down by the department.

A test paper will be set to this group along with one more division of standard VIII, and questionnaire will be given to the pupils as well as to their guardians concerned. Also at the end of the year, they will be given other questionnaires to study their study-habits at home. These questionnaires are not to be marked and this fact will be told to them to facilitate them to answer them freely.

The guardians will be further required to fill in the questionnaires very carefully as they are going to help us in evaluating the experimental project and not their wards.

Note. 1) The guardians are requested to return the questionnaire duly filled within two days.

2) The guardians are further requested and invited to see the teacher concerned during office hours if they have any query on this questionnaire.

3) The guardians employed in some scientific work are requested to help us in our effort by giving advantage of their knowledge if and when necessary.

APPENDIX II

Experimental Class in General Science

QUESTIONNAIRE FOR THE GUARDIANS

It is once again stressed that this questionnaire is not meant for assessing the achievement of pupils but is meant for evaluating the efficacy of the programme of the experimental class in general science. You are requested to answer these queries on the back of this sheet and on the additional sheet if necessary.

(1) Has your child ever tried to re-perform at home any of the experiments taught to him or her in the school? If so, please give details.

(2) Has your child ever asked you questions regarding natural phenomena such as, lightning, earthquake and rains? If so, what questions?

(3) Has your child ever insisted on visiting any factory or laboratory? How many places are visited by him?

(4) Give full details regarding any attempt by your child to understand the functioning of toys or contrivances, such as a clock, a sewing machine, etc., working on scientific principles.
(5) Give details regarding any opportunity your child might have got of developing a scientific hobby such as, photography, meccano, etc.
(6) Give particulars as regards attempts made by your child to understand causes for daily occurrences such as, spoiling of milk, food, etc.
(7) Is any member of your family in such a vocation in which science or technology is made use of (e.g. pharmacy, medicine, etc.)? If so, say if he or she can be useful for purposes of giving a talk or paying a visit to the experimental class. It is requested that general alterations as regards this may be given.
(8) If your child thinks of joining in future any vocation involving the use of science, please mention the vocation and your feeling about it.

Note: 1. Please see that this questionnaire is answered in two to three days. Similar questionnaires will be sent to you at the end of the year. So, you are requested to watch the aptitude and inclinations of your child and to observe his method of studying various subjects. In order that you may not forget the date and timing of your observations, you are requested to note them down as the same are of great importance, looking to the development of the child.

2. VIII F is an experimental class while VIII B is an ordinary class.

APPENDIX III

Experimental Class in General Science

STATEMENT ON SCIENTIFIC ATTITUDE AND METHODS CIRCULATED TO PUPILS

What is meant by scientific attitude?

The scientific attitude implies the way of observing and interpreting natural and social phenomena, objectively. With some effort you also can develop it. The salient features of scientific attitude are listed below:

— A desire to observe carefully what is happening around oneself.
— A desire to seek cause and effect relationships in the happenings.
— A desire to seek adequate evidence before accepting any hypothesis.
— Readiness to give up one's hypothesis on receiving new evidence.

- To have respect for the work and opinions of others.
- To have faith in the belief that cause and effect relationships exist for natural phenomena.

What is meant by scientific methods?

The scientific methods are ways of working out problems objectively and systematically. Dogmas and blind faith have no place in them. They can be achieved if we

- perceive the problem in its proper perspective;
- collect relevant first-hand information and evolve probable hypothesis to explain the phenomena;
- test the hypothesis, if it stands, with the limits of its derivation and application.

Note: When you go through the stories of science, you will come across many instances, wherein scientific methods were adopted.

APPENDIX IV

SUGGESTION ON SELF-STUDY CIRCULATED TO PUPILS

You are going to solve problems perceived by you along with those assigned to you as the course of study. A variety of ways and means of self-study is suggested below for your information and action. While preparing your notes on the various problems and projects, you are required to indicate the ways and means adopted by you. Particularly, the difficulties and failures experienced by you, should be described at length. It is important that the answers given by you should be complete and correct. But the process of arriving at the conclusions is definitely more important, and so, it must be indicated in detail. You are expected to adopt methods of self-study instead on relying on textbook and classroom instructions alone. It is true that you are not used to such new methods of study. But the methods suggested here would be very useful this year and in the years to come.

The ways and means of study

- You can make use of the science textbooks prescribed for standards VIII to XI in your school. You can have them from your friends in standards other than yours.

- Supplementary textbooks and reference books from your class library will prove to be useful to some extent.
- Your science teacher will help you in the class and outside to plan your efforts, instead of giving you ready made solutions for the problems.
- Your guardians, neighbours and friends who are interested in your progress can help a lot in your efforts.
- Some of the guardians of your classmates are people working in fields of science; they can help your class in your group projects in a number of ways.
- You can have first-hand knowledge by visiting farms, factories and laboratories, whenever, it is possible.
- You can perform relevant experiments in the laboratory and science-club attached to the school.
- There are hundreds of simple harmless experiments which can be performed at home without equipment or expenditure. It would give you good training.
- Audio-visual aids can help you developing skills in representing your findings.

APPENDIX V

SAMPLE WORK SHEETS

UNIT ONE

Air : Our first necessity

I. *The ocean of air at the bottom of which we live*

- How big is the ocean of air?
- What are the properties of its components?
- Why can we not live without air?
- In what different ways is the air in the cities polluted?
- How does impure air affect health?
- How do natural agents purify air?
- How should we manage to maintain a supply of pure air in our homes?
- What are the measures taken by municipalities to keep up the sup-

ply of pure air to the towns?
- How is it that the oxygen is not exhausted from the atmosphere?

II. *Ventilation for our homes*

- What are the changes in the composition of air that are brought about by respiration?
- What is the volume of air required by an average person, per hour, for respiration?
- Which are the methods of ventilation used in houses?
- What are the methods employed in public buildings for ventilation?
- What are special advantages of residing in sanatoria?
- What first-aid would you provide to a person who has been suffocated?
- In what different ways is the sun useful to us?

UNIT TWO

Food : Our second necessity

I *Planning our diet*

- Why is it necessary for every body to take food?
- What different requirements are met by the different components of food-stuff?
- Why is planning of diet necessary?
- How does the planned diet differ from person to person?
- What are healthy food habits?
- What are the advantages derived by cooking food properly?
- Why do the dieticians recommend pressure-cookers?

II *Working of the digestive system*

- How are different components of food imbibed in the body and used up?
- How does the food reach the stomach from the mouth?
- What are the changes undergone by the food in the stomach?
- What further changes take place in the intestines?
- What part does the liver play in the process of digestion?
- How are the complaints about constipation and indigestion met?

- In what ways are the waste products of the body eliminated through the skin, lungs and kidneys?
- How are skin diseases avoided?
- How are the complaints about kidneys caused?
- How was inoculation started?

III *Gigantic pressure exerted by the atmosphere*

- What is the history of measuring atmospheric pressure?
- What are the different things working on air-pressure?
- What are the constructions of different barometers?
- What is the present day knowledge acquired by man about strata in the atmosphere?
- What do the mountaineers feel on expeditions?

IV *Respiratory system and its diseases*

- Why is respiration considered to be a process of slow combustion?
- How is carbon-dioxide prepared in home, in the laboratory and in the factory?
- To what properties are the uses of carbon dioxide due?
- How does the oxygen get mixed up with the blood system?
- How do the bellows of the lungs work?
- What is the proper method of breathing in air?
- How do we catch a cold?
- How does one prevent catching a cold or it spreading to others?
- How are other diseases concerning lungs caused?
- How was penicilline—the wonder-drug discovered?

UNIT THREE

Appliances needed for our homes

I *Light for the home*

- How are the sun and the moon useful to us?
- How are the solar and lunar eclipses caused?
- What is the story of illuminating the home?
- On what principles does the camera work?
- How do the sides change in the image in a plane mirror?

- Prepare a simple periscope.
- Prepare a kaleidoscope.
- What is light and how it is produced?

II *Fire for the home*

- Why is there a little gap between two consecutive rails?
- Why is water heated from below?
- Why is a glass chimney used in lanterns?
- How does the thermos-flask keep things hot as well as cold?
- Why is it not so cold on cloudy nights?
- Why were safety-lamps used in mines?
- What are the heating devices used in homes, factories and vehicles?

III *Modern appliances for home*

- How would you prepare an electric bell?
- How would you prepare a mariners' compass?
- How would you prepare all kinds of magnets?
- How would you preserve the magnets?
- Prepare a list of instruments in which magnets are used.

IV *Topics for collecting information only*

- What is the difference between the reflectors of street-lamps and those of motor-cars? Why?
- What are the different types of window-glasses available?
- What are the limitations of human eye?
- What are the precautions taken to save human life from extremes of cold and heat?
- What are parallax and illusion?

UNIT FOUR

Our body and its care

I *The skeleton and bones*

- Write an essay on 'If man had no bones'
- Write an essay on 'If a human skeleton had no joints'
- What is the chemical composition of bones?

- In what ways do the size and shape of bones relate to their functions?
- What care is necessary for bones?
- What are the different types of the bone joints?

II *Muscles : the packing material*

- Write an essay on 'If man had no muscles'
- Which muscles are not controlled by the brain?
- What care is necessary for the muscles?
- Compare the organisms moving on earth, in the air, and in the water.

III *Health is wealth*

- What are the common causes for diseases?
- Why is it important for every body to do exercise?
- What are the proper methods and ways to take exercise?
- Why is it necessary to take rest?
- What are the proper ways of taking rest?
- What is the importance of cleanliness of the body?
- What considerations are important in the choice of clothes?

IV *Topics for collecting information only*

- It is interesting to know the story of artificial fibres.
- Read books on the lives of Pasteur, Jenner and others who fought diseases.
- Arrange a talk on mental health and hygiene by some expert.
- Collect information about occupational therapy from the offices of guidance and employment.

UNIT FIVE

Food for the growing population

1. *Earth: The store-house of food*

- What are the components of the earth? In what ways can its components be separated?
- How do the kind and quantity of the harvest depend on the land?

- What are the different measures adopted by the Indian Government to face the problem of shortage of foodgrains?
- In what ways are the main crops of our state cultivated?
- How should one develop a kitchen-garden?
- Why is it necessary to change the kind of the crop the following year?
- How is fertility of the land increased?
- Why is it useful to grow more trees?

II *Topics for collecting information only*

- Arrange a talk by some agriculturist about improved cultivation in other countries.
- Visit the offices of the Bharat Krishak Samaj and other organizations for collecting information about cow-dung, gas plant, etc.

8

IMPROVEMENT OF SCIENCE TEACHING IN SECONDARY SCHOOLS

ROMA GUPTA

THE IMPORTANCE of teaching science in schools has been realized. Science is being taught in schools for two purposes:

1) To prepare citizens with a scientific background so that they may appreciate and make use of the findings of scientists, technologists and engineers,
2) To prepare future scientists, technologists and engineers.

I shall deal with the first purpose only. To fulfil this, science instruction should begin early in life, since a child has had science experiences even before coming to school. For example, a child has experiences with pouring water from one container into another; washing and drying clothes, using soap, floating boats and dropping things into water. Both at the elementary and secondary stages science should be general. Since this paper is based on my own experience, I shall deal with the secondary stage only and with reference to general science. It may sound curious but it is true that when I first started teaching, I never gave a thought as to why I was teaching science. I took my teacher-training first and then started my professional career. Somehow, from the very beginning, I did not want to do all the talking. I wanted my pupils to participate in a lesson. I spent each morning in preparing the experiments that I would show my class. But I felt that I was getting all the experiences and rich were those experiences too! I never had experienced all that in my college days. At the back of my mind there was a constant gnawing–what are the pupils doing? Then I decided to break up the class into groups, or may be the pupils decided that, I forget what really happened. However, the tables were turned, they were doing and I was watching.

Gradually, another question started bothering me. Why are we teaching science? In the meantime, educators had also been thinking on this problem and they changed the 'Elementary scientific knowledge' into general science. There were refresher courses and we tried to formulate the objectives of teaching in general science. We wanted to teach children facts, concepts and principles of science which they can use to interpreting problems in their own environment; to open new avenues of interests and satisfactions; to develop certain scientific ways of thinking and solving problems; to form certain attitudes like open mindedness, intellectual honesty; to develop instrumental skill; to relate changes in society to development in science.

I came to realize that what we found in science books was the record of man's achievement. Is not such a record termed history? I also realized that memorizing that history would not change pupils' thought and action. Science is a way of thinking and acting–this realization brought confusion to all my former thoughts. The more I read, the more I realized that I had been working like a machine. I had been thinking more of the subject matter than of those whom I was teaching. In my readings, I came across the following passage "Teachers often fail to realize that pupils must pay the price for every ability acquired and as a result teaching frequently becomes the process of lifting, carrying, dragging, pulling, showing and otherwise assisting the pupils along to the end of the course, subject or term. Teachers do the reading, the explaining, the thinking, the talking, the appreciating, the devising, the planning; the problems are teacher-worked, the reasons are teacher-thought out, the formulae are teacher-derived, the apparatus are teacher set-up, the causes are teacher-enumerated, the beautiful is teacher-selected, the wicked is teacher condemned, the right is teacher praised; all the pupils do is to remain passive, to listen, to copy, to memorize and finally to recite or to write in a stated time what they can squeeze out of crammed minds. Then came a chance, I was sent to the U.K. on a study-cum-training scheme. There I found answers to many of my problems.

On my return, I started reorganizing my work. I had seen a quotation which impressed me very much.

> "I have five senses you must reach,
> If I am to learn and you to teach,
> With taste, touch, smell and sight so clear,
> Must I receive all sense by ear?"

This led me to think about the learning process:

The child is an investigator. A child seeks to participate in planning and in carrying out his activities. A child follows his individual pattern in developing concepts. The child learns through doing.

I thought of leading my pupils to investigate problems. I divided the course-content into units, for example, in class VII, they had to deal with three units.

(1) The air we breathe.
(2) The water we use.
(3) A healthy body.

Since air and water are essential for life, the pupils made a list of problems they liked to solve.

—Where is air found?
—Does it occupy space?
—Has it weight?
—What does air consist of?
—Is air necessary for breathing?
—Do other living things need air?
—How can we make use of air?

Similarly, they formulated problems about water. In our introductory lessons, we discussed why we study general science, thereby the objectives were made clear to them. Then we discussed how best these objectives could be realized and in so doing we also discussed the work of scientists. More discussions followed as to how to solve the above problems. Experiments were devised, there were reference books to help, observations were made, inferences were drawn and conclusions were arrived at. These were recorded, diagrams were drawn and labelled. No pupil was bored since this was what they had wanted to do and all were doing something. How could I manage 40 pupils working at experiments? Where was the space? I had to break up the class into three groups as I had seen in schools of England. When one group came to me, the other group had some other subject. How to supply the pupils with apparatus? We started with simple things, instead of flasks we used bottles. Tripod stands were cut out of Dalda tins, spirit lamps were made from ink bottles. Tins were cut to produce troughs. Spring balances were used for weighing and wooden planks for inclined planes. Pupils made their own charts and models. They were learning better since they were experiencing by as many senses as possible, and the problems were pupil-thought-of and the apparatus was pupil-set-up. There was a feeling of achievement. It was a pleasure to see them work. I moved from pupil to pupil, discussing with them and noting how the work was progressing. The library of science books was at their disposal. They could issue books in their name whenever they wanted. I taught them how to use the index and stressed the idea that no one can be a walking encyclopaedia but that we should be able to find out facts when required.

The pupils tried various things. We found difficulty in obtaining materials but still we did not lose heart. All these years I was the only science teacher in our school. Then the multipurpose scheme was started. We had enough of flasks, tripod stands and numerous other things. We had many science teachers and more laboratory space. Then I heard about the Rs. 1,200 grant of the then All-India Council of Secondary Education for the opening of science clubs. We applied for it and received the grant. The Government of West Bengal also gave us a recurring grant of Rs. 300 for the science club. The club members wanted photography, so we started with the science of photography and a bathroom was turned into a darkroom.

I wanted to know what other schools, other states, other countries were doing. I joined the All-India Science Teachers Association and attended the annual conferences. I took the trouble of taking our pupils' exhibits to the conference. I started writing articles for the *Vigyan Shikshak* and *Teachers Quarterly*. I attended study-circles organized by the Extension Service Departments. I joined the National Science Teachers Association of America and received their *Science Teacher*. I affiliated our school science club to the 'Science Clubs of America' and obtained their sponsor handbook and their pamphlet *How to Run Your Science Clubs*. I joined public libraries so that I could get books to improve my teaching and to get new ideas. Our field trips and interest in the community has made me come into contact with many people, scientists, and educators, both Indian and foreign. I made personal contacts with scientific suppliers and they are always ready to help me. I joined the Career Master's Course and this has helped me a great deal in improving myself. It was like 'Physician heal thyself.' I have tried to overcome fear and nervousness and have never refused a request for writing an article or giving a talk.

Then began the reform in examination. I was thrilled at the idea for this would remove rote learning. I framed objective test-items with enthusiasm. I decided to have 40 per cent on objective type tests and 60 per cent on essay type tests for science examinations in our school. A change has come in the pupils. They have realized that learning by heart passages from the textbooks will not help them solve problems. Understanding is required and for this individual effort is required. The pupil has to realize that education and the products of learning cannot be bought like many things in life. How much one gains depends on the extent he exerts himself. This does not apply for science only but for all subjects. Hence all teachers have to realize this.

I had to go through many phases of my teaching career to place before you the changes required for the improvement of science teaching because these changes were not made in a day. I have written in this fashion for another reason. I wanted to show that the improvement depends on each individual teacher and not on the authorities only.

In the end, I would like to recapitulate the points which have helped me:

—Willingness to learn and to try out ideas
—Varied interests—photography, reading, woodwork, gardening, travel,
—Joining professional associations and attending Science Teachers Conferences
—Participating in seminars
—Attending vacation in-service programmes
—Training abroad
—Preparing units and using problem solving approach
—Having not more than 25 girls in the science class at a time
—Having pupils participate in activities
—Having a science club
—Using community resources, films and field trips
—Using new type of tests
—Using laboratory facilities
—Free use of science library by pupils
—Membership in public libraries
—Cooperation of the headmistress and staff

For the new teachers, hope lies in the training college. I hope this paper will make it clear that the programme in training colleges will have to be changed. Teachers in training will have to learn to use new methods of teaching so as to fulfil the objectives of science teaching. They will have to learn to teach not from a book but from a unit developed by themselves. They will have to learn to arrange for activities in which pupils will participate. They will have to learn to prepare test-items so as to be able to evaluate what they have been teaching. All this then will form a part of their practice teaching programme. They will go to their appointments with new courage and new faith.

APPENDIX

In order to encourage and help schools in science club programmes, the West Bengal Government offered a recurring grant of Rs. 300. I do not know whether this was offered to all government schools or to those schools which had received Rs. 1,200 grant from the Directorate of Extension Programmes for Secondary Education.

The All-India Science Teachers Association has its headquarters at Delhi at the Central Institute of Education, 33 Chhatra Marg, Delhi-6. Science teachers or any one interested in school science can become a member by sending Rs. 5 (yearly subscription) to the treasurer at the above address. Schools can be affiliated by sending Rs. 10 every year. Every member receives a copy of the *Vigyan Shikshak* four times a year and an affiliated instituion gets two copies of each issue. Individual members and two nominees each of an associate institution are entitled to participate in the annual conference which is held in December during Christmas. Life membership fee is Rs. 100.

The National Science Teachers Association of America is a department of the National Education Association and an affiliate of the American Association for the Advancement of Science. One becomes a regular member of the association by sending the yearly subscription of $6 which can be sent to the Association at 1201 Sixteenth Street, N.W., Washington 6, D.C. through a bank.

All members receive *The Science Teacher, The Elementary School Science Bulletin,* the packet service and special mailings of selected instructional materials. *The Science Teacher* and *The Elementary School Science Bulletin* are published eight times a year.

Affiliation to the Science Clubs of America, costs nothing but the postage stamp with which you send a letter to Science Clubs of America, 1719 Street, N.W., Washington 6, D.C.

The Science Service, 1719 N. Street N.W., Washington 6 D.C. is an institution for the popularization of science and is organized as a non-profit corporation. It publishes

a) *Science News Letter* weekly consisting of news of science, important developments, new inventions, research and helpful information. Yearly subscription is $5.50.

b) *Chemistry* eight times a year. Yearly subscription $4.00.

c) *Things of Science* experimental materials with instructional information come to members in a blue box, twelve times a year. Yearly subscription $5.00 (add $1 overseas postage.)

American Association for the Advancement of Science, 1515 Massachussetts Avenue, N.W. Washington 5 D.C.

Annual dues of $8.50 cover both membership and 52 issues of Science Magazine, as well as the quarterly *Science Education News* and the quarterly newsletter *AAAS Bulletin*.

The *School Science Review* is published for the Science Masters Association and the Association of Women Science Teachers of the U.K. Membership fee is $1. For information write to Dr. Boulind, University of Cambridge, Department of Education, 17, Brookside, Cambridge, U.K.

Science Digest is published monthly at 200 East Ontario St. Chicago II, Illinois, U.S.A, and may be obtained here at book stalls.

Other science magazines are *School Nature Study* published from 23 Crystal Palace Road, East Dulwitch, London, S.E. 22 U.K.; *School Science*, a quarterly science magazine (subscription Rs. 8 annually), published by Publication Unit, National Council of Educational Research and Training, 114, Sunder Nagar, New Delhi.

9

THE TEACHING OF SCIENCE IN SECONDARY SCHOOLS

Z. N. PATHAN

ONE OF the characteristics of a democratic society is change. In periods of crisis such as the one that has existed since the close of World War II and is likely to continue for a long time, change is greatly accelerated. Another characteristic of democracy is that the people through their organized institutions and representatives are expected to direct change. Making a decision on what road to travel is a difficult process and one which cannot be left to whim or caprice. Fortunately our society accepts the idea that the common man through the use of intelligence is capable of making the best decision.

At present our society is confronted with momentous decisions as to the directions in which change should take place. Our way of life is threatened both from without and within. On the world scene, the threat of total war is constantly in the foreground. Technological development has forever destroyed the possibility of natural isolation of countries from war. Science tells us plainly that there can be one world; yet, it seems, clashing ideologies are likely to prevent the realization of a united world. Science and technology have also provided man with the instrument which may be used to destroy himself, or to build a better world. Clashing ideologies now prevent him from utilizing the fruits of technology for promoting human welfare. The constant threat of destruction through total war cannot but colour the attitudes and activities of people all over the world. And this threat has a profound effect upon the outlook and security of the youth.

On the national scene which, of course, reflects the world climate, we as a people are beset by indecision, conflict and confusion. We want world organization, but we fear inroads upon our national independence. We want government to assume increased responsibilities for social welfare but this desire runs counter to our cherished ideals of personal freedom. We want increased control of industry but at the same time we want to protect the 'free enterprise' system.

The confusion and conflicts sketchily presented above are inevitable in a dynamic democratic culture. We are continuously struggling for greater clarity. The quality of the decisions we make will influence the future of democracy.

This is the kind of the world in which the young people of today are growing up. Clearly an educational programme which is not based squarely upon a realistic interpretation of the problems which beset youth in this kind of world, is not capable of playing a major role in the preservation and refinement of democracy. It, therefore, behoves educators and laymen alike to take a critical look at the high school which the society has set up as an important agency for building democratic citizenship.

High School Examination and the Challenge of the Times

As the outset of a discussion on curriculum reorganization in the high school, it seems appropriate to examine briefly the present status of high school science education. This will be done through asking and answering of a series of pertinent questions and the attempt to discover discernible trends. The purpose is to clarify the issues and problems facing the high school rather than to present solutions.

- — What progress have we made in providing a high school science education for all over the country?
- — Do high schools carry on their science programmes in the light of consistent, well developed philosophy or set of purposes?
- — To what extent has a high school science curriculum kept pace with

the new demands made on it by the changing socio-economic scene and the new concept of adolescent needs?

— How successful have high schools been in utilizing sound educational theory and experimentation in improving classroom procedures?

— To what extent are evaluation programmes in the high school geared to the modern conception of the purposes of high schools?

— How adequate are high school buildings and equipment for carrying on science programmes?

— What role do high school teachers play in curriculum improvement?

— How satisfied are high school students with the science curriculum?

— How satisfied are high school students with the science curriculum reorganization?

— What part do parents and other laymen play in promoting or retarding curriculum reorganization programmes?

— Do teacher-education institutions play a dominant role in curriculum reorganization programmes?

— What influences do college entrance requirements have upon curriculum reorganization?

It may appear from the study of the above problems that the high school is a decadent institution and should, therefore, be supplanted by a new type of school which is free from traditions that hamper change. Once teachers become convinced that reorganization is needed, these trends may be expected to develop rapidly and, therefore, we emphasize learning rather than teaching.

Learning *versus* Teaching

The concept of teaching and learning which a teacher holds is inseparably bound up with the values or goals which are considered to be of prime importance. For example, if a teacher believes that the acquisition of facts and information is the most important outcome of learning, then it follows that his concept of teaching will be that of repetitive drill, and he is likely to subscribe to a theory of learning that is congenial to his practices. If the teacher believes that the development of independent critical thinking is a major value in our democratic society, naturally he will organize the work of classroom in terms of problems to be solved, issued to be considered, plans to be made and executed. Consequently, he is likely to subscribe to a quite different theory. If the teacher believes that obedience to orders is of great significance in citizenship education, he will stress students to follow directions without questioning. Automatic responses will, therefore, be prized. Logically, such a teacher should support the connectionist school of thought. But if the teacher holds firmly to the idea that cooperative planning is a value inherent in democratic living, obviously he will organize the life of the classroom in terms of cooperative development problems and projects. This implies a more dynamic organismic approach. Probably most teachers are not conscious of the learning theory which underlies their practices. They operate in terms of the exigencies of the situation. This is not to say, however, that teachers should not be students of the learning process and its implications for democratic citizenship.

The modern trends of education advocate that the task of educators is to utilize the most effective principles of learning for promoting democratic values. In general, the organismic or field of theories of learning seem most congenial to the purposes of democratic schools. It is possible to develop generalizations concerning learning for the guidance of the teachers in the classroom. The following are important:

- Learning is an active process, which involves the dynamic interaction of the learner and his environment.
- Learning is most effective when the learner is motivated by goals which are intrinsic to the activity.
- The most significant type, of learning in a democratic society is characterized by reflective thinking rather than mechanical habit formation.
- When the problems are of common concern, group thinking is the most effective approach to learning.
- Skills, appreciations and understanding are most effectively developed as a unified whole rather than each in isolation from others.
- Transfer of training is most effective when the learning situation is so organized as to facilitate generalization, and to recognition of relationships.
- The development and modification of attitudes is a problem of learning which has great significance in our democratic society.

General Science and its Problems

General science is perhaps the most difficult of the types of science courses to teach well, since it necessitates content mastery of a wide range of materials. General science has held its prestige largely on the following basis: (a) it serves as an exploratory course to stimulate decision about the science courses to be elected later and (b) it gives some broad treatment of science for students who for various reasons do not wish to take much more closely defined courses as biology, chemistry or physics.

There is an added advantage for general science, in that it is a foundation course for a systematic sequence in science offering. Among the more important aspects of general science which should make important contribution to life adjustment and retention of identity at the same time are:

(1) General science begins with an understanding of science as a way of life and of learning with scientific attitudes and scientific methods as important adjuncts.*

(2) It introduces the students to the vocational possibilities in the various sciences.

(3) It identifies the civic problems associated with water and milk supply, prevention of food, health laws, sewage disposal, etc.

(4) It gives an introduction to conservation and the control of waste.

(5) It offers an invitation to hobbies and leisure time activities.

(6) It gives an intensive treatment of personal health, diseases, importance of wise selection of food, etc.

(7) It provides an interesting treatment of the communication and transportation problems brought about by our one world concept of today.

Need for the Project

General science was introduced as one of the subjects in secondary schools in Bombay state in 1955. Before 1955 physics and chemistry alone were taught in secondary schools. Science teachers working in the schools were neither qualified nor trained nor experienced to teach other branches of sciences i.e. biology, astronomy, zoology, etc. For physics and chemistry they generally followed the laboratory methods. But the laboratory method could not be used for all units and branches in general science. It was found that the teachers used mainly the narrative method and consequently pupils in general lost interest in the subject. It was, therefore, felt by us necessary that an experimental project in teaching of general science should be undertaken to arouse interest among pupils for this subject with the following objectives:

- to help pupils study the scientific aspects of the primary necessities of life (food, clothing, and shelter),
- to help pupils study from the scientific point of view the physical environment and the forces of nature that govern the environment,
- to help pupils study how science has tried to use and control various forces of nature,
- to develop in pupils scientific attitudes (the habit of accurate observation, the spirit of inquiry and the scientific way of thinking and judging), and
- to develop permanent interest in scientific reading, discussions, hobbies and research.

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*This may be true in own countries but not in India—Ed.

Syllabus

The syllabus in general science was not the same as that prescribed by the education department in the Bombay state, but when this experimental project was continued for four years in our school, the pupils covered not only the entire course prescribed by the department and the S.S.C. Board but they had an intelligent understanding of the life around them, and the scientific principles that govern it.

Procedure

In the beginning of the year two divisions of standard VIII were formed on a basis of usual academic level. One class worked in general science on traditional lines and the other on the experimental basis.

The pupils of the experimental class were divided into six groups under six leaders. Each group consisted of six or seven members. Under the guidance and supervision of the science teacher in charge of the experiment, the whole class participated in planning and executing the work. Each group was assigned the same or different topics from the syllabus to be studied independently on project lines. A meeting of the members of each group was held once a week or sometimes twice a week, generally on Saturdays after school hours, for a discussion on the work done by every pupil of the group. The reporters noted down the difficulties of the problems which could not be solved by the group. Then panel discussions were held. Problems that remained unsolved were brought before the general assembly of the whole class for finding out the solution. Guidance and help were extended by the science teachers, wherever necessary.

Methods

The methods adopted and the different activities undertaken by the pupils to carry out the experiment were as under:

— Reading books from science section of the library
— Contact with persons and invitees
— Collection of specimens
— Experiments in laboratory
— Group experimentation
— Visits
— Preparation of charts and models
— Organizing exhibitions
— Dramatisation
— Preparations of albums

Evaluation

Evaluation work was carried out by the following tools:
— Written test
— Practical test
— Year's work
— Teachers' observations
— Grading of personal qualities

On the completion of each part of the experiment, an objective type of test was administerd to the pupils. The test consisted of true-false statements, matching items, multi-choice items, selection of the suitable alternative types of items, short questions, etc. This was supplemented by a small essay type test. Apart from written periodical tests, practical tests were also administered to this experimental class.

The part taken by the pupils in co-curricular activities connected with science, their day to day work (practical) in the laboratory, craft room and art room, their regularity in doing home lessons and tests on attitudes were evaluated through an internal marking scheme. The pupils' results of the experimental class were compared with those of the controlled class. Moreover the cumulative record cards of all the pupils were maintained and the pupils main personal qualities were graded every year by the class teachers. The year's entries made therein were compared with those of the previous year.

The results of the written tests were studied under three heads.

(1) Percentage of passes in each subject. (2) Average scores in each subject. (3) Percentage of pupils scoring more than fifty per cent marks.

The statistical analysis of the results clearly indicated the influence of the experiment on other school subjects also. It also showed all-round superiority of the experimental group over the controlled group.

The results of the practical tests, attitude tests, activity tests, and news tests showed that pupils of the experimental class had developed scientific attitudes, scientific outlook in life, and the habit of reading newspapers.

Evaluation of personal qualities as entered in cumulative record of the pupils showed that the project had fostered among pupils many virtues like hard work, sociability, initiative, self confidence, etc., the virtues that are quite imperative for success in life.

To assess the influence of the experiment on pupils' all-round growth during the learning activity of the project, the following points were also taken into consideration.

(1) Quality and quantity of assignments completed by the pupils during the year. (2) Extra books read during the year (3) Reporting and recording observations correctly. (4) Evidence of responsibility. (5) Co-

operation and getting along with others. (6) Developments of interest in hobbies. (7) The power of observation. (8) Scientific spirit and spirit of inquiry.

Observations

(1) The pupils analysed the diets and made improvements in their eating habits at home and school too.

(2) In the long recess in the school the pupils purchased eatables such as fruit, tomato, cucumber, groundnuts, carrots, etc.; and seemed to avoid buying these from the hawkers standing outside the school premises.

(3) The good eating habits of the pupils of the experimental class influenced also other students in the school to improve their eating habits.

(4) Habits of cleanliness were noticed, i.e., keeping the classroom, benches, clothes, hair, teeth and nails neat and clean.

(5) Whenever and wherever possible or necessary, the pupils were found trying to tap original sources of scientific information, as for example, cloth merchants, doctors, engineers, factories, mills, etc.

(6) Whenever they came across the new machine or a mechanical device such as spinning wheel, *Amber Charkha* and various spinning and weaving machines, etc., in the mills, they observed them carefully and felt interested in the movements involved therein.

(7) Pupils were found interested in dyeing the saries of their mothers and sisters at home.

(8) The pupils discussed the choice of cloth with their parents.

(9) When buying cloth at the market, the pupils explained to their parents what is bad and good in cloth. Thus they helped their father and mother in selecting inexpensive but good quality.

(10) When the pupils were taken on visit to different colleges in the university area they were found observing the sloping floors of the colleges and auditoria, the water supply and sewage disposal in the laboratory, window panes, and modern buildings, etc.

(11) The pupils were found studying the water supply, sanitation, disposal of waste of the school.

(12) Pupils discussed different aspects of their houses with their fathers at home.[1]

(13) Pupils studied points of similarity and dissimilarity among different phenomena such as conductivity, conviction radiation, density and specific gravity.

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[1] The parents invited on the Parents' Day reported the facts mentioned in items 1,7,8,9,12 above.

(14) They thought of the proper form of representation (sketch, graph, table, diagram, etc...).

(15) They understood apparatus and analysed the working of apparatuses.

(16) They could arrange the apparatus for an experiment.

(17) They seemed to take the necessary precautions while carrying the apparatus.

(18) They developed scientific hobbies such as album making, preparation of a file of cuttings from various bulletins, magazines and newspapers.

(19) They could repair, prepare and reconstruct the scientific model or apparatus.

(20) The participants in the experiments used to come to school during holidays. They devoted extra time after the school hours for reading different books, discussing and preparing reports, preparing charts, albums, hand manuscripts, bulletins, etc.

(21) When they arranged exhibitions of their projects works, one could see the formation of the sense of individual and group responsibility and capacity of organizing collected and hand-made materials and articles.

(22) The reports of the teachers in charge of various activities showed that the experimental class was found to be more disciplined, polite, active, and cooperative with teachers as well as one another.

(23) The parents reported that their wards had been more punctual and active in their studies and their other activities at their home.

Conclusion

The traditional sciences of the secondary schools are usually thought of as including general science, biology, physics, and chemistry. To imply they have failed to contribute generously to the working equipment which our youth need for adequate living would be erroneous. It should be emphasized that the traditional sciences have served well and will continue to serve, as long as, they are offered in the well accepted present patterns. However, it should be quickly reaffirmed that a well organized selection of science content from traditional sciences can readily render a much improved service to our youth. It is here maintained that each of the traditional sciences is making significant contributions to life adjustment, but then an improvement in organization and content of learning materials and activities will set the stage for vastly greater gains towards producing well adjusted citizens.

10

SOME SHORT-COMINGS OF THE PHYSICS SYLLABUS OF THE RAJASTHAN BOARD OF SECONDARY EDUCATION

PATRICK P. D'SOUZA

An important instrument for the much-hoped-for reconstruction and improvement in science education at school level is the science syllabus. In the following pages an analysis of the revised syllabus of elective physics of the Rajasthan Board of Secondary Education is presented to contribute towards a still more effective syllabus.

Whatever be the suggestions, they must conform to the objectives of science teaching as formulated by those in charge of education. So, before we proceed further, let us review the objectives of physics teaching.

Objective of Teaching Physics

The commonly accepted objectives of science teaching at the Secondary stage were formulated by the Seminar of science teachers held at Tara Devi (Simla Hills) in June 1956. They are given on the next page.

- Imparting knowledge of scientific facts and theories to the students.
- Developing the proper scientific attitude.

The second objective will become clearer if we go through the objectives listed by the same seminar for the teaching of science at the middle school level.

- Arousing and maintaining interest in nature and in the physical and social environment; arousing love for nature and the habit of conserving its resources.
- Developing the ability to reach generalizations and apply them for a systematic way of thinking.
- Developing the child's powers of manipulation and his creative and inventive faculties.
- Developing neat and orderly habits.
- Inculcation of the habits of healthful living.
- Acquisition of a fund of information concerning nature and science.
- Developing the ability to reach generalizations and applying them for solving everyday problems.
- Understanding the impact of science upon our way of life.
- Developing interest in scientific hobbies.
- Inspiring children by stories about scientists and their discoveries.

The Seminar organized by the Directorate of Education, Delhi, in July 1959[1] add the following: *At the higher secondary stage, the information, concepts and principles taught should be functional. Further, the programme should develop instrumental and problem solving skills, scientific attitudes and appreciations.*

Another point to be considered about the syllabus of elective physics is that it is related to college physics. Hence it has a preparatory character. It should prepare a student for specializing in physics, by giving him the necessary concepts for further deeper study and the skills required for practical work[2].

Summarizing all that has been said above, we can enunciate the normally accepted objectives of the teaching of physics at the higher secondary school as follows[3].

Knowledge Objective: To acquire the basic concepts and principles of science necessary for a specialized study at the college level.

Skill Objective: (a) To develop an understanding of the scientific method and the skill to use it. (b) To develop certain essential skills, intellectual as well as mechanical, necessary for further theoretical and practical study at the college level.

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[1] *Teacher Education*, Vol. III, No. 8. 1959 pg 22 Sqq.

[2] S. Doraiswami, Science in Secondary Schools. *The Education Quarterly*, Spring 1961. Pp. 19-21.

[3] V.N. Wanchoo, The Use of Science Textbooks and Some Teaching Techniques. *Vigyan Shikshak*, Vol. II, No. 3, 1958.

Transference Objectives: To develop the ability to apply the knowledge and skills acquired in the service of man.

Attitudes and Interests: (a) To develop open mindedness and a co-operative attitude. (b) To develop a desire to investigate the world around us.

Knowledge Objective

Choice of Topics: The first objective is to prepare a student intellectually for specialized study at the college level, by furnishing him with the necessary basic concepts and principles. To a large extent, the syllabus is successful here. The fundamental concepts are insisted upon. But the syllabus seems to have been drawn at least two decades ago, for it does not mention modern topics. Speaking of England, Professor Bernal says: "There is little, in fact, in school physics and chemistry that was not known three hundred years ago....." A similar grave accusation could be made against the physics syllabus prescribed by the Rajasthan Board for the higher secondary examination. A change is definitely called for; and it is not difficult to do the needful. Why cannot photo emission and general ideas of quantum theory be included in high school physics course? Boulind, in his book, '*The Teaching of Physics in Tropical Secondary Schools*,' suggests how many recent concepts can be introduced into a high school syllabus. Westaway, in his well-known book *Science Teaching*, devotes an entire chapter to excellent suggestions for the same purpose.

In Russia, every school student including those who do not intend to specialize in science at the university level, covers in his final year at school[1] such subjects as atomic structure, artificial radio-activity, energy released in nuclear reactions, cosmic rays, nuclear power stations, use of radio-active isotopes in agriculture and industry, etc.[2] How many of our science students at the high school level, or even at the college level, can explain at least the import of all these topics?

This unfortunate state of affairs in schools leads to two undesirable results. First of all, it lowers the standards of study. Since the undergraduates do not even know the names of some of these topics when they join the college, they learn only the elementary aspects of these questions till their graduation. In the post-graduate classes, a little more is done. Hence, often at the post-graduate level, the Indian students study what their counterparts in England or Russia would know before their graduation. *Electricity and Magnetism* by Starling is the textbook for B.Sc. Pass course in England. In India, a large part of the book is done at the M.Sc. level.[3] Nuclear reactors are not even mentioned in our B.Sc. lectures. Neither is photo-emission explained. The second and more deplorable effect is that children do not see the connection between science they study and the scientific inventions and technical progress they hear about.[4] If they could be made to realize the intrinsic relation between what they see and their study, there would be more interest in the subject and the application to life situations would be evident. But as it is, the absence of new, developing concepts robs science of its life-giving interest and makes its study unnecessarily dreary.

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[1] The Russian school is for the age group 7-18 years.

[2] cfr J.L. Lewis in Bulletin of the Institute of Physics, July 1961.

Perhaps modernization is the only way to break the vicious circle that hampers a purposeful study of the sciences. Syllabuses are set with an eye on the examinations; the most suitable questions for the examinations are often the least interesting and also the oldest parts of physics. These render the syllabuses lifeless and lessen the interest of the students; hence to increase it, great stress is laid on the examinations, even the experimental part being fossilized in the process.[5]

Presentation of Topics: There is another grave shortcoming in the syllabus regarding the knowledge objectives. A syllabus should have a conceptual unity i.e. it should be an organic unity, not a jumble of disconnected topics. The concepts it intends to teach should logically flow from one to another and should be presented psychologically as a connected whole. But the syllabus in question has serious drawbacks on this point.

A first glance at the syllabus shows that it is drawn with the examinations in mind. It sets out those points which can be tested in the usual type of examinations. It names a few topics, neither specifying them sufficiently, nor relating them either to one another or to life. It gives a mere topical outline.[6]

We need not go far to find its cause. The syllabus as it stands does not demand any knowledge of the philosophy, the history and the method of science, or any acquaintance with its contemporary theoretical and experimental frontiers.[7] Hence is merely expects the children to acquire a set of essentially unrelated inert ideas: the children learn but little of what may be called the tactics and strategy of science as a discipline.[8] We can illustrate the evil effects of this lacuna by summarizing a chapter in *Physics, a Modern*

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[3] This may be true of a few universities in India-Ed.

[4] It is difficult to agree with this view of the author-Ed.

[5] J.D. Bernal, *The Social Function of Science*, London, 1946. Pg. 253.

[6] V.N. Wanchoo, The Use of Science Textbooks and Some Teaching Techniques. *Vigyan Shikshak*, Vo. II, No. 3, 1958. Pg. II.

Approach, by L. Paul Eliott and William F. Welcox which avoids these defects. The title of the unit is The Riddle of Light. The introductory note is worth quoting in full.

> "In this unit, you will discover that scientists themselves do not have all the answers to the question, 'What is Light'? As you seek to understand the nature of light, you will study the contribution of such intellectual giants as Newton and Einstein to the solution of this fascinating riddle. In addition following the work of a scientist at the frontiers of knowledge, you will also gain insight into many practical problems. You will discover the answers to such puzzles as what causes a mirage, how glare can be eliminated, how we see, how photographers measure light, and why no two people see exactly the same rainbow".

Then the chapter begins with the statement of the problem: Newton's objections to Huyghen's theory. In the meantime, rectilinear propagation, umbra, eclipses, reflection and refraction are taught, the unity of treatment, being supplied by the application of both theories to known facts. The first chapter ends with a note of question mark: "Would one of the most brilliant and most renowned men ever to live, the pride of all England, prove to be correct? Or would Huyghens, the comparatively unknown Dutchman, emerge victorious?" The second chapter begins with Young's discovery and the entire chapter of interference and polarisation is taught in his aspect of solving the problem. By the end of this part, the pupils are in favour of Huyghens. Then, briefly, comes Michelson and Morley's experiment which questions the existence of ether. The chapter ends with a brief account of relativity. Once again, are we for Newton or Huyghens? A few pages ahead, spectrum and fraunhoffer lines lead to electro magnetic waves and this is a vote for Huyghens. This is followed by the photo electric effect and now Newton leads. The same method continues with Planck's quanta, DeBroglic's matter waves, Einstein's E-ms^2.

Our syllabus cannot produce such a study because it neglects the historical method acquainted with the contributions of various scientists to our scientific knowledge. This does not mean that we should follow the historical method always. But attempts should be made to knit together va-

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7. The Science Masters Association in the United Kingdom have listed four objectives of Science Teaching in Secondary Schools. The second is to acquaint the student with the general direction in which science is progressing and with the nature of knowledge being acquired so that he will be at home in the scientific and technological world in which he is living.
8. cfr B.D. Laroia, Science Teaching under the Changing Pattern of Secondary Education, in *Vigyan Shikshak*, Vol II, No. 1, 1962.

rious topics of the syllabus, and to make the study of science an interesting and joyful experience.

In brief, the syllabus fails to present the content of physics as a connected, living body of concepts. It only suggests some questions to be prepared for the examinations.

Sequence of Topics

It was remarked above that the order of topics should be logical as well as psychological. On this basis a further suggestion could be made regarding the order of topics. However, it is so much against the accepted method, and to the best of my knowledge not suggested by anyone that it is presented with great hesitation. The joy in elective physics consists in realizing in the laboratory, the concepts studied in the lecture room. Children look forward at the beginning of the ninth class to the laboratory period. But what happens is practice? For the first three months the students are not taken to the laboratory because they have not studied sufficient theoretical portion which would enable the teacher to allot experiments to all. Further, these experiments are far from being interesting, for 'general properties of matter' is taught at the beginning of class IX. How can one have the joy of work while measuring the diameter of a copper rod with a screw guage or in finding the specific gravity of oil with a specific gravity bottle? There is no scope to individuality; there is no challenge to initiative. So, right from the beginning, the students lose interest in laboratory work. It is reduced to the twenty-two experiments which are to be done.

Perhaps this state of affairs could be remedied if the course of physics for class IX were to start with Light. Right from the first chapter laboratory work could be linked with theory work. Even if drawing a raw diagram 'finding the position of the image in a plane mirror', 'mirrors at right angles,' 'the rotating mirror', etc., are not the specified experiments, these can be used to teach the children the experimental method, laboratory discipline and the method of keeping record books. The apparatus required is so little and cheap—a mirror strip costs 10 p.—that every student could work separately and experience the joy of work much more effectively. In this way individual and interesting laboratory work—as opposed to demonstrations by the teacher—could be begun right from the beginning. Perhaps 'General Properties of Matter' is logically the first part of physics. But it is by its nature uninteresting to a beginner, and the experiments worth performing require at least one month of theory. 'Heat', easily lends itself to experimental work, but it leads much too early to mathematical physics. Current electricity, too, has the advantage of being useful for assigning laboratory work to beginners but its theory would probably be too great a challenge to them.

One word about the place of mathematics in secondary school physics. as Dr. D. S. Kothari remarked in his presidential speech at the Science Teachers Conference held at Udaipur in December 1961, "An adequate amount of mathematics is required for physics. But let us not over-do it. Does not our syllabus by insisting too much on mathematics at this stage, neglect the great physical concepts? The syllabus in general is interpreted by the examination paper. Textbooks are written in view of the examinations. If we are to sample some examination papers and some textbooks, we would be surprised at the neglect of physical and experimental details, while emphasis is given to mathematics. No doubt mathematics is important. Physics that is not rendered precise by mathematics, run the risk of becoming a juggler's handbook". Yet, considering the immaturity of the students has not Dr. Kothari done well to warn us against overemphasis on mathematics in physics at the secondary stage? Since our knowledge objective is mainly in view of the specialized study at college, we should emphasize the fundamental physical concepts more.

Skill Objective

The second important objective of physics teaching is the skill objective: the development of the scientific method and the skill to use it. The syllabus attempts to achieve it, but fails, rather miserably. It gives a list of twenty-two experiments—all disconnected. It does not mention the easier, but fundamental experiments in reaching manipulative skills. It does not encourage the real scientific spirit. There are many schools which perform only the prescribed twenty-two experiments. Consequently, the children neither understand the experiments nor learn to manipulate the apparatus. The joy which should accompany laboratory work is usually absent because most of these experiments do not illustrate the leading concepts of the theory they study. They are only the 'experiments', much of the work being torn out of its natural setting[9].

The revised syllabus of the higher secondary classes of Madras State has shown a more correct path. It has indicated the main demonstrations to be performed by the teacher and the practical work to be done by the students. The experiments are also more numerous. The Rajasthan syllabus could be improved if the experiments were to be integrated with the theory. Students should be able to perform all the experimental proofs they study in detail except those which the syllabus explicitly reserves for demonstration by the teacher. Further, the syllabus should specify certain general skills which every student should attain as for instance to weigh a body, to find the volume of regular and irregular bodies, etc. During the practical examinations, these skills rather than the performance of experiments should be tested. We are forced to say that the skill objective is only hoped for, not worked for in the present syllabus.

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[9] cfr S.P. Singh, The Science Syllabus, in *Vigyan Shikshak* Vol. II, No. 3. 1958 Pg. 9 sqq.

Transference Objective

The transference objecive demands that the knowledge and skills attained should be functional. Perhaps it is difficult to specify such transfers of knowledge in a syllabus. Many textbooks to a certain extent pay attention to this aspect. However, the syllabus could certainly have done its part for the transference objective, at least as far as the skills are concerned. At least some of the experiments suggested and demonstrations proposed should have been functional. Calculating the specific gravity or the co-efficient of expansion or the resistance of an electrical conductor will become mere learned lumber, if the student does not also learn how to apply these in various situations. A student should be able to calculate the wattage of a bulb, to select and fix an electrical fuse and relate some of his scientific knowledge to everyday life.

Such type of laboratory work not only helps in sustaining the interest of the students, but also in making them realize the usefulness of the knowledge they obtain in the science class. This incentive is unfortunately absent in the syllabus of the Rajasthan Board[10].

What then ,is the final judgement on the syllabus?

The above observations on our physics syllabus highlight some of its weak points. If we leave out the relatively unimportant observations about over-emphasis on the mathematical part of physics, the other defects are errors of omission than of commission: it has been shown that the syllabus is lacking in a well-knit plan, that it does not include important modern concepts, that the emphasis on correct laboratory skill is insufficient and that it practically excludes the philosophy and history of physics which could have converted the heterogeneous topics into a living organic whole. Errors of ommission are more easily rectified when the execution is in the hands of a capable person. A good teacher or even a good textbook can, to a great extent, make up for these shortcomings. So the errors pointed out in the syllabus are not in themselves beyond correction.

However, when we look at the actual condition of our schools, we are forced to qualify the judgement. A good textbook could help the learner and lessen the ill-effects of our syllabus. But where are the good textbooks for school physics in India? A capable teacher could achieve the objectives of science teaching in spite of an ill-framed syllabus. But how many of our schools have capable science teachers, i.e., teachers who have mastered the necessary concepts and who have also learnt the correct methods of teaching? So the factors which could have overcome the limitations of a defective syllabus are themselves absent. Hence, it is the solemn duty of the framers of the syllabus to draw it up in such a way that it can be an effective means of instruction which unfortunately it is not at present.

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[10] cfr T. R. Lakshminarayan, in *Teaching*, Vol. 34, No. 1, 1961. P. 18-24.

II

TEACHING AND LEARNING OF MATHEMATICS

M. G. CHAPHEKAR

We should always have before us the important place that mathematics has in this machine age. In our every day life one cannot do without mathematics. A thorough understanding of mathematical principles is necessary in advanced scientific studies. Civil and military departments of the government, banks, posts and telegraphs, railways, agriculture and medicine all these need a fair amount of mathematical knowledge.

In this article, the discussion is limited to the secondary school mathematics. A boy who has acquired a systematic knowledge of mathematics in secondary school, finds his way easier in any walk of life than his other friends. It is, therefore, necessary for us to find out ways and means to make the teaching of mathematics more effective in the secondary school.

The learning of mathematics on the part of a pupil depends mostly on how the subject is taught. Before a pupil enters a secondary school he learns arithmetic for four years in a primary school. The effect of teaching arithmetic during this period is more or less permanent on him. It creates a liking or disliking in him for the subject. During this period, he must be able to do fundamental operations accurately, speedily and with confidence. Not only he is expected to be well acquainted with coins, weights and measures in his surroundings but also he must be able to use that knowledge about them in examples to some extent. This much preparation is expected of a boy entering a secondary school. In this respect it is necessary to have regular discussions between teachers of standard IV of primary schools and of standard V of secondary schools. It is found advantageous by experience that the teacher of standard V should be asked to set the paper in arithmetic of standard IV for the annual examination.

The age and the respective ability of the pupils must be taken into consideration at all stages of instruction. Generally, a sort of dislike and fear is found amongst the children for the subject. The instruction in the elementary stage should be made more interesting and methodical. There is a general misunderstanding about the modern methods amongst the teachers, with the result that the recitations of tables and such other practices are neglected. Pupils in this age are not in a position to understand the utility of the same and hence teacher should skilfully create interest in them for the subject.

Now let us consider how the secondary school teacher should be equipped for his job. Here we have to consider subject matter and the method of teaching.

It is obvious that a teacher of mathematics should have a keen interest in the subject and he should find pleasure in it. Without this, it is not possible for him to teach mathematics effectively. Even if a teacher is well versed in the subject, a student taking mathematics should be equipped with basic skills in fundamental operations like multiplication and division with sufficient speed and accuracy. He must master certain short-cuts for the same. He must be conversant with the easier and convenient ways of using decimals which have important place in our daily life.

In geometry he must be able to draw figures with the help of instruments accurately and with a reasonable speed, he must have clearer idea of the faces, heights, etc. of the solids like pyramids. Before dealing with topics such as ratio and proportion and a graph of the second degree in algebra, heights and distances in trigonometry, a teacher should have a thorough preparation on his own part. Civic arithmetic is a new subject to many of us as it was not included in the curriculum when we were students. A teacher has a rare experience in his every day life about cheques, hundis, drafts, discounts, brokerage, exchange rates, stocks and shares, income-tax, insurance, etc. It is, therefore, obvious that a teacher himself will have to study these topics carefully before teaching these to his class.

The other part of his equipment relates to the method of imparting instruction. In the training college, he is acquainted with some methods of teaching the subject but unfortunately several teachers find them of no practical use. They have no real faith in the training college methods and the faith gradually dwindles with the years of actual teaching. For this there may be some genuine reasons. The present limits and expanse of the subject preclude him from using various methods that he has learnt in the training college. We meet very few teachers who definitely state they use the training college methods and they are able to do full justice to the subject in the prescribed curriculum. In some cases, the head teachers advise them to keep aside the B.T. methods. Under these circumstances, the new teacher is somewhat confused.

The method should be elastic. Any method is good that facilitates learning on the part of the class. Some times, there is a confusion about understanding of the subject and the reproduction of the subject. In mathematics many pupils arrive at the conclusion without understanding how they got it. I shall quote an example in support of this. "A trinominal $a^2-7a+10$" can be factorised by asking pupils to find out two numbers whose sum is -7 and the product is 10. The class will learn the rule by heart and with all finish a number of examples without understanding how this rule is arrived at. If the class begins from products of such expressions, it will be easier for them to see how the middle term is composed and will know why the middle term is to be split up in a particular way. The teacher should not insist on new methods or on the old methods. He should use such method which will be useful for better understanding and learning, considering the age and ability of his pupils.

A teacher should always be open minded to make improvements in his methods as he gets more and more experience. In this respect some suggestions which will be useful, particularly, to new teachers, are given below.

Before teaching, a teacher should thoroughly prepare his lesson. He must clearly know what topic he is going to teach. What aids he will require, what examples he himself is going to solve, what examples he expects his class to attempt, what probable difficulties he will face, how he should get over them, what would be the probable difficulties to his class and, how he shall assess or evaluate. Then he should know how far his class has understood the topic taught, what will be the home-work to the class and for what reasons he is giving the same. A teacher should have a clear cut plan for his lessons. Sometimes the class brings him unexpected difficulties which he has not thought of. On some occasions, pupils offer very good suggestions. The teacher should be mentally willing to accept those suggestions. It is not a good practice to discourage such suggestions. It may create dislike for the teacher on the part of pupils.

A new teacher should draw weekly plans of his subjects and show them to the head teacher or to the supervisor or to the experienced teacher in mathematics and should seek guidance, where necessary. The senior teachers while giving guidance to their junior colleagues, should see how improvement can be made in their teaching. Ultimately it should improve the learning on the part of the pupils. A senior teacher should go to the class of his new colleagues and should show them like an elder brother how particular difficult topics can be taught. A junior teacher, in his turn, should seek guidance from the experienced teacher, should invite him to his class and follow his guidance.

The arrangement of observation of about thirty practice lessons (inclusive of all subjects in the training college) is insufficient. A pupil teacher must observe at least 50 lessons in mathematics during his training period. It may be suggested that during his leisure time he should attend as many periods of the experienced teachers of mathematics as he can possibily do. This will remove many of his doubts and will solve many of his difficulties.

A teacher has before him the curriculum and the prescribed textbooks. He attempts to finish the portion prescribed for the annual examination during the time at his disposal. While doing so, it is necessary to revise certain topics before beginning new ones. There should be some provision in his scheme for the revision. For this, the senior teachers should come to gether, discuss and prepare a plan for the month-wise distribution of the subject. A new teacher should not be asked to do this. This plan should not be a permanent one. It should improve with experience. It should show only a rough idea as to what topic is to be finished during a particular month. The other details being left to the teacher concerned.

In addition to this, experienced teachers in different schools should come together and prepare a plan for a year for each standard. Here there should be no particular textbook before them but the topics in the prescribed curriculum should be taken into consideration. Some of the points on which purposeful discussion could take place are: how many teaching periods will be available during the year for the subject?

What are the main objectives and sub-objectives in teaching these topics? What will be the learning experience for the pupils? What will be the part of the teacher in the lesson? What aids will be useful? How many oral or written examples the boys shall be expected to do in the class? What will be the home work? How many total periods are available during the year and how many of them can be given to a particular topic? How many periods may be spent for revision and internal examinations?

Regular workshops for this should be held and the reports prepared should be followed in schools. It is my personal experience that such lesson unit plans are useful for teachers to bring about better learning on the part of pupils. While knowing and prescribing the curriculum teachers who have actually taught the subject for a number of years should be consulted. They have the actual experience of working with the pupils and as such they know what and how much a child of a particular age or of particular ability can understand. I have directed one workshop of this type. We worked out a plan of lesson units for standards VIII and IX in mathematics. The report of this workshop has already been published by the Poona extension services department.

In the teaching of mathematics the textbook plays an important role. While prescribing and sanctioning a textbook, it is done after a careful scrutiny by the experts, still however experienced teachers should be consulted for such type of work. This would help in bringing good textbooks in our schools.

There are some teachers who are proficient in the theoretical planning of a topic, possess different novel ideas, have made good collections of useful examples and constructed a good number of examples. But their efforts are hardly known to others in the field. It is essential that resources of this type are publicized and made available to other teachers.

While entrusting the teaching of mathematics to a new teacher his personal preparations in the subject should be taken into account. I know the case of one head-teacher, who used to examine such a teacher in mathematics. A teacher should continue teaching the same standards say fifth to sixth at least for three years. If there are five or six divisions of the same standard, they should be in the charge of two teachers. This produces a healthy competition among the teachers and develops a sense of cooperation among them. The teacher during these three years will acquire a full mastery over teaching techniques of the subject to those particular classes. He will understand what should be additional work for the gifted few in his class; and how to deal with the average and the backward pupils. After this experience he should be promoted to next higher standards. Thus in about twelve years, he would have taught all the standards from five to eleven and be really an expert master in the subject.

Besides this, another method of taking the teacher to the higher standards with the same pupils, can be used with advantage. But here the selection of the teacher should be made more carefully. In this scheme there can be two teachers. One for V to VII and the other for VIII to XI. I have tried myself this method and got excellent results at the final examination (S.S.C.).

In one high school, two textbooks in arithmetic were prescribed for the same standard. One was to be used for class work and the other for home work. The book prescribed for home-work was some what more difficult and the teacher got homework from the pupils according to their ability. The idea behind these two textbooks was to have much practice work. With some modification in this, it can be said that an additional supplementary book may be used for home work and for brighter pupils.

It is a fact that our classes will be crowded with an average of 50 to 60 pupils. In such a class the teacher has so many problems—how to pay individual attention, how to motivate all the pupils to learn, how to make all pupils work simultaneously and with somewhat uniform speed, etc. It is difficult for him to spot out those pupils who do not show any progress in mathematics. I shall now discuss a method which I have been using with some success to get over these difficulties. The class is asked to read silently one example from the text twice or thrice. Then they are asked to find out from the example what is given and what is to be found out. This should be got repeated twice or thrice. Then they are asked to find out how to proceed for the solution. Thus they are made to think. The questions and answers take them to the desired answer and also give them a clear idea of the process. The figure work and calculations in such examples is so easy that they could done orally. The hard and difficult calculations are done with the help of the brighter boys orally or by the teacher on the board.

In this way, the teacher proceeds and gets the process repeated from two or three brighter boys; then again from two or three average boys. Thus within five or six minutes, there are five or six repetitions of the process which help to fix the examples in the minds of the pupils. The same is done for home work (now written). Thus the oral work in the class is supplemented by the written work at home. The process continues for the whole period, but then there is no written work done in the class. As an alternative half the period is devoted to oral work and in the remaining half the class is to do the written work based on the oral work done in the first half. The examples left behind are given for home work.

When some other method is used, it is natural that all the pupils cannot work with the same speed. It is found that some pupils leave certain examples half done and take down the succeeding ones. Here the teacher asks his pupils to complete all such examples at home.

Completing work which was left half done in the class should be a regular feature of home work. This kind of home work is generally very successful. Pupils, when working silently under no pressure at home, are generally able to follow such examples and can solve them. We should make it a point to see that there is no example in the note book of a pupil which is left half done.

In almost all the textbooks there are not enough examples of one particular point. The second example is somewhat different from the first. The third one is different from the second one and so on. This does not give opportunity to the pupil for sufficient drilling on one type of questions.

To avoid this difficulty the teacher should construct examples for drilling. Such examples should not involve complicated calculations. If the teacher is not able to construct such examples in the class, he should collect examples from different sources. The pupils should also be made to construct such examples in the class. The class may be conveniently divided into two groups. Pupils of the first group should set an example and the pupils of the second group should try to solve it. It is pleasure to watch such competition of framing and solving examples (even orally) in the two groups. Here it will be found that examples formed by pupils will be from their own level and experience and they will have a real joy and interest in their solution. In this respect I have been using a method which is as follows. The whole class is asked to stand up. They are given examples on the board. If the examples are easy they are asked to solve them orally. They should write the answers in their note books. (I ask my class to spare the last 4 pages of their note books to write the answers of such oral examples). After writing the answers, they are allowed to sit. This offers a change in the constant sitting posture. As they have to stand, they become more attentive. This helps the teacher to locate such pupils who solve examples quickly, who are average and who are slow workers and lastly who are the dullards. The teacher should not himself tell the correct answers. He should get answers from the pupils. He should write the different answers on the board. He should discuss the mistakes of the pupils and lead them to the correct answers. This gives him an idea how some pupils think incorrectly. He can then help them to get the correct answers. This should go on till all the pupils get the examples correctly. This method is found useful in the fixation of operations, in directed numbers, using and removing of brackets, simple equations, decimals and such other topics.

Helping the class to reduce and minimize their mistakes is helping them indirectly to make progress in mathematics. Common mistakes should be written on the board. They should be discussed with the help of the brighter pupils and it should be insisted that the same mistakes should not be repeated. Mistakes in directed numbers, brackets, fractions and such other topics should be discussed and the principles involved in them should be fixed.

Just as in the physical exercises the teacher starts with some such exercise which helps pupil to warm up in the same way before beginning a mathematics lesson the teacher should use some oral examples to gain momentum. They may be written on the board and pupils should be asked to find out the answers. A little time, say about five minutes, may be regularly spent every day over such exercise. This helps them in developing speed, accuracy and skill. It also revises some topics. Such examples should contain simple multiplications, divisions, fractions, decimals, average and, percentages. These may also include the finding of values of certain angles in geometry, simple equations and examples on index notations in algebra. I am giving below a specimen of such examples as used in standard IX of the Maharashtra State.

1. $77 \times 87 \times 77 \times 16 =$
2. $4x^2 - 1/9 = (\qquad) ($
3. $7x = 7 \therefore x =$
4. The Angles of a Triangle are $x,^0\ 2x,^0\ 3x^0 \therefore x =$
5. $33\frac{1}{8}\%$ of 75
6. Find simple interest of Rs. 300 .at 5% for 146 days
7. $8a^3 - b^3 = (2a - b)$ (.........)
8. $(x \ldots\ldots\ldots)^2 \ldots\ldots\ldots\ldots 4x)\ 4\ldots\ldots\ldots$

Tne pupils should be made to vearify their answers in mathematics whenever possible. They should be confident enough about their answers. They should also be able to estimate the answer. The strange and ridiculous answers which pupils often get may be written on the board, and should be discussed and corrected. It should always be impressed upon their mind that common sense is the fifth rule in mathematics. They must know that their answers must generally be based on common sense.

Examinations

The examination results show the pupil's progress in mathematics. Here it is important to see in what topics he shows progress and in what topics he is lagging behind. The examination result should be used to get this kind of knowledge about each pupil of the class. The result-sheet should show pupils' marks questionwise. In geometry the result-sheet should show the pupil's score in theorems, in riders, in constructions and in calculations. Preparation of such result sheet is an additional labour but it is useful to the teacher to understand his pupils' progress more accurately. A result-sheet can be prepared in algebra and geometry thus shown below

ALGEBRA

Name of the pupil	Equations	Questions on equation	Factors	Application of factors	H.C.F. L.C.M.	Total
Maximum Marks	10	10	10	10	10	50
A	4	0	8	4	5	21
B	6	2	5	5	5	23
C						

GEOMETRY

Name of the pupil	Theorems	Riders	Constructions	Calculations	Total
Maximum Marks	20	15	10	5	50
1					
2					
3					
4					
5					
6					

While setting a question in the examination one should be clear about the objectives for which the question is being set. In mathematics in general there should be three objectives. (1) Knowledge of the subject, (2) Application of the subject. (3) Skills. If our examination papers are set in this way it will be easier for us to assess the progress of our pupils. The above result-sheet can also be made as follows:

ALGEBRA—GEOMETRY

Name of the pupil	Knowledge of the subject	Application of the subject	Skill	Tota
Maximum Marks	20	20	10	50
1				
2				
3				

Besides the annual examination in mathematics there should be two diagnostic tests, one in standard VIII and the other in X. Pupils of the ninth and tenth standards should be given proper guidance based on their examination results in the eighth standard. The pupils of the ninth standard should be given guidance as to what course in mathematics they should select for their S.S.C. examination. There should be a separate test once a year for the brighter pupils.

In teaching mathematics, projects should be used wherever possible. Teacher should be able to find out such projects. I am giving in the next page some projects that could be conducted in our secondary schools after some initial information is given to the pupils.

1. *Averages:* The class may be suitably divided in some groups. The average weight of each group should be taken and from it the average weight of the whole class may be found out. Here the weights should actually be taken by the pupils. In the same way average heights of pupils, average attendence of the class, average temperature of a month and average rainfall for a month may be found out by the pupils themselves.
2. *Accounts:* The schools should have a co-operative store and a group of pupils may be entrusted by rotation to look after the purchase, sale and the profit. All this work may be done by the pupils.
3. *Geometry and mensuration:* Under the supervision of the teacher the class may be asked to make pitches for Indian games such as *Langadi, Kabbadi, Kho-Kho,* etc. In higher standards surveyors methods can be conveniently used for drawing a field plan and finding out its area. In the Diwali vacation pupils may be asked to prepare sky-lamps which will give them idea about triangles and quadrilaterals, etc.

In the higher standards an experiment regarding collection of examples can be made. The class can be divided into number of groups. Each group may consist of three to four pupils. Each group may be asked to collect examples and solve them systematically in their note books on a topic entrusted to them. One group will be doing equations, the second will be doing problems, the third will be doing factors, etc. Thus here will be a good collection of examples on each topic and these can be used by all the pupils for reference and revision.

As regards the preparation of simple instrument, pupils can be asked to prepare certain simple instrument which they can use in their regular work. Some examples of such instruments are a circular protracter to measure angles, a circle showing the thirty-two points of the mariner's compass, card board rulers to show comparison of feet, inches and centimetres, card board cut triangles giving an idea of congruent triangles, a simple instrument to show angles of elevation or depression, etc.

In certain books, specific assignments for pupils are given. They are expected to do them themselves. Teachers should prepare suitable assignment and give them to their pupils.

The points discussed above are based mainly on the experience of teaching the subject continuously for the past twenty-five years. During this period I had the experience of teaching mathematics to all the standards from five to eleven.

Besides actual teaching I had varied experience in supervising and giving guidance in lessons, setting model question papers, and giving guidance to others in this respect, assessing answer-books and moderating assessment of other, planning a year's work for different standards, bringing dull pupils to the average level of the class, giving special guidance to brighter pupils at the S.S.C., and discussing certain topics with textbook writers. I also got some opportunities to attend the seminars and workshops in mathematics. All this gave me some ideas in the field of mathematics. This occasion of the seminar readings has given me the opportunity to express all my ideas which I have gathered so far through my varied experience.

12

IMPROVEMENT OF SCIENCE TEACHING IN SCHOOLS

K. VENKATARAMIAH

We science teachers, have both a responsibility and an opportunity of training our students to develop a scientific outlook on life and a scientific approach to problems, so that they may play a useful role in life and give their best to the society in the modern age of science. To improve science teaching in our schools I have found, by more than eighteen years of experience and experimenting, some simple and easy methods which are very successful. I tried my methods in teaching science to large classes having a minimum strength of 70 students. I never had the advantage of a satisfactorily equipped laboratory. I am, therefore, confident that my paper may be of some interest and use to my fellow science teachers who face similar handicaps that are common in most of our schools. It is these and such other handicaps that hamper science teaching and they will be with us, I am afraid, for a long time to come. But, handicaps rightly viewed become challenges and there is the joy of adventure in facing them and overcoming them.

I have found that the greatest factor in improving science teaching is the teacher's approach to problems not only in the laboratory and the classroom but in all his dealings with his students and his colleagues. Students have an instinctive desire to believe, love and imitate the teacher's attitude and manners. If the students find their science teacher applying scientific method in all his dealings, they learn his science lessons better. They must feel a little of the glory of the scientific spirit in their teacher's personality if his science teaching is to be purposeful and effective.

Field Trips

Careful observation and open mindedness are very important traits to be acquired by the students. But classroom opportunities are not enough for the development of these traits. I have found that hikes and excursions are very useful in developing these and other qualities essential for a scientific temper of mind. When the teacher roams about with groups of students following him amidst nature the sense of curiosity and observation become very active in students. At every step they have something to wonder at and ask the teacher '*The How and Why*' of things. This sense of wonder, in which the pursuit of knowledge begins, can be used very effectively to teach many aspects of animal life and plant life in a natural setting, the effects of weathering and denudation and the interconnection between the different branches of science.

I have explained many topics in general science during these outings and I have succeeded in making even the most backward student feel the joy of understanding. These outings are very useful in making collections for the science museum. Specimens of rocks and seeds become very valuable possessions of students. Topics such as plant parasites, insectivorous plants, animal coverings, nitrogen cycle, carbon cycle and weather conditions can be very easily and effectively explained to students.

A night camp is very useful to explain many portions of astronomy in general science. I have casually drawn the attention of my students to the wonders of the heavens. I have pointed out the milky way, the venus, the pole star, some of the constellations and meteorities, with the whole sky as the god given laboratory. To my great joy I have found that it is very easy to harmonize the truths of religion and science and explain in simple terms the need for mixing spirituality with science.

Incidentally, these close contacts with students help a teacher to gain their confidence and affection which are very valuable in improving teaching.

Improvising Apparatus

It is needless to mention that experiments are very essential in teaching science. Whenever laboratory equipment is not enough for any experiment, I have successfully tried improvised experiments. The *Unesco Source book for Science Teaching, The How and Why Wonder books* and magazines such as *Understanding Science* are very helpful in devising experiments with improvised apparatus made out of scrap materials such as card-board boxes, useless electric bulbs and bottles, and hoop-iron. I have often been thrilled by the improvised apparatus devised by my students for making electric bells, telegraphy sets, telescopes and microscopes and many other things. These efforts have helped the students in grasping fundamental scientific principles and applying them in daily life.

Charts

Students who are good at drawing enjoy home assignments for preparing charts to explain topics in science. Germination of seeds, life histories of animals, flower parts, storage organs in plants, the solar system and such other topics are illustrated through charts. When these charts are used by the teacher to explain those topics, the students' reactions are very favourable and the lesson has a special interest for them.

Science Clubs

I firmly believe that a science club is as essential as a good laboratory to improve science teaching. A science club provides proper opportunities to students to develop their scientific talents and skills. Whenever a spare room is not available for this activity I have used a part of the laboratory after class hours on three days in a week. A simple tool box, a few show cases with glass shutters and a small library are very essential for a science club.

Simple guidance and motivation through science books bring about wonderful results from the activities performed in a science club. I have often found it difficult to accommodate crowds of students enjoying the use of tools till late in the evening and some of those occasions are the most memorable in my teaching career. The science club activities help the students to learn science by their own effort and it becomes great fun to use simple tools.

At the week-end meetings of the science club students feel honoured when they are invited to demonstrate and explain their improvised experiments. Other students get an incentive to show their skill. These activities develop desirable social norms of honouring merit and learning from one another with an open mind.

Scrap Book

The habit of keeping scrap books help students to collect and classify scientific information from magazines and newspapers. Indirectly students develop a habit of reading and keeping in touch with the growing knowledge of science. Albums provide an incentive to collect pictures and photos of scientists. Bulletin boards play a good part in motivating science club activities.

Museum and Library

It is necessary to have a science museum to display students improvised experiments, charts, collections of rocks and seeds, preserved specimens of plant life and animal life and such other items. A museum grows without any extra effort when the science club functions properly. I have used the walls of the practical hall to display these achievements when I could not get a separate room for the science club and museum.

The library section of a science club must have simple books illustrating concepts through beautiful pictures and explaining scientific topics in simple language. Fortunately, we get wonderful books such as the Health Science Series. How And Why Wonder Books, Junior Science Encyclopaedia volumes, Signet Science Books and the like which attract students considerably.

Knowledge and *Understanding Science* are two weekly magazines which are very valuable in making students love and learn science. These books and magazines are useful both to the teacher and students. Students with their own effort seek more and more knowledge.

Science Festivals

Science festivals such as unveiling of portraits of scientists, and celebrating memorable scientific events are important to give the students a vision of greatness of science and scientists and to show how 'lives of great men all remind us that we can make our lives sublime'. I have often entrusted the responsibility of celebrating different events to different classes and sections.

I have won the affection of students by using extra classes for telling stories of Edison, C. V. Raman, Madam Curie, Ramanujam, Faraday, Newton, Darwin and other giants of science. I cheerfully welcome extra classes for the sake of these opportunities. They have helped me to make my science lessons more interesting and meaningful specially for standard VIII students.

I have often used the 'Shadow' play to make certain scientific events memorable for my students. A big white screen and a powerful light from behind are all that we need. Beautiful shadows are cast on the screen. I have shown the fundamentals of the scientific method through a shadow play. The boy Edison trying to hatch eggs, Pasteur sucking saliva through a pipette from the mouth of a mad dog, Archimedes entering the bath tub and then running for the joy of discovery of the great principle, Bruno getting burnt for the sake of his discoveries and many other such events have been shown with the help of shadows. There are beautiful stories in the Chandogya and Brihadaranyaka Upanishads to show how our sages explained great religious truths through simple experiments. I have brought these stories to life on the stage and the students have realized how the scientific method must be applied to all aspects of life.

Films, and magic lantern slides are very useful in visual education. Fortunately there is a film projector in my school and the USIS and the Five-Year Plan publicity organization are lending films every week to our school. Films on the working of the heart, the human body, principles of electricity, simple machines, gift of the green and other scientific topics have played a very effective part in making my science lessons interesting and purposeful to the students. They have given me new ideas to improve my science teaching.

Every year towards the end of the term a science exhibition is very useful to give a bird's eye view of the entire syllabus in science. This must be a joint venture of all the science teachers in a school and if possible a combined effort of all nearby schools. Such an exhibition helps to bring the parents also into contact with the school and its activities and secure their co-operation and goodwill for many educational activities.

Action Research

In my classroom work, in addition to proper preparation for the lessons, 'the action research approach' to classroom problems is very useful. A workshop on 'action research' which I attended helped me very much to clarify my thinking and, especially, the guidance given by Dr. Stefen Corey at the workshop has been very valuable to me.

At the end of every lesson I tried to think of its effect on my students. Whenever I feel disappointed with my lesson I do a little action research and try to rectify the defect. I shall illustrate my point by briefly narrating one of the very simple experiments I did. I found that most of the students in standard VIII were not drawing good figures connected with science lessons. I conducted a diagnostic test by drawing a neat figure of a leaf on the black-board and I labelled the parts. I asked the students to copy the figure on a sheet of paper and give it to me. I collected the papers and evaluated them. I analysed the causes and found that many students had not used pencil and rubber. Many had not labelled the parts. Only a few students who seemed to be good at drawing had drawn neat figures. Then I applied certain remedial measures. I insisted on their bringing pencils and rubbers and I explained to them the importance of figures in science lessons. I myself carried some pencils and pieces of rubber to put to shame the indifferent students. I effected some changes in my own methods also. I gave them enough time and drew the figures with proper timing and labelled the parts in capital letters with a red chalk. After applying the remedial measures for about eight weeks I conducted another test. I drew a figure to explain the parts of a flower and labelled the parts. When I evaluated this test, I found a remarkable improvement in the students attitude to figures. They had understood the purpose and value of neat figures in learning science. Sometimes, I have applied this method in co-operation with colleagues in the science club activities and the results have always been a very pleasant surprise.

Conclusion

With a sense of confidence I can honestly assure my fellow science teachers that I have been successfully using all these methods in making science teaching fairly effective in spite of the many handicaps which are common in most of our schools. I believe it is against the spirit of science to draw a long face and complain of handicaps. Many of them are beyond our control. So we have to accept them as a part of our educational environment, at least for some time to come. To change this very environment we have to improve our science teaching so that our students play their part well in building a strong and prosperous nation. Science and technology must be properly used for this enormous and urgent task.

Science has come to play a very important part in our daily life. Unless we improve science teaching in our schools there is little hope of a bright future for our mother land. We science teachers have that wonderful opportunity of training batches after batches of students in scientific skills and in making them useful members of the society.

Let us be worthy of this great opportunity and responsibility.

13

SECONDARY SCHOOL MATHEMATICS IN A SCIENTIFIC AGE

J. C. W. RUST

INDIA TODAY urgently needs thousands of young men and women with a sound scientific education; agriculture engineers, mining, electrical, mechanical and civil engineers, doctors, business men, bankers. All these are needed for the full implementation of the Five-Year Plans. The Science departments of the schools and universities are alive to this urgent need, and are striving hard to meet it. The All-India Seminar on the Teaching of Physics, held in Delhi in June 1962 recommended a thorough revolutionary overhaul of the physics syllabus to meet the requirements of modern progress. Such subjects as orbits of satellites, radar, radio-activity and nuclear physics are included in their recommended secondary school syllabus, necessarily at the expense of many time-honoured but outdated topics. But this realistic attitude of the Science Teachers Association cannot bear its full fruit unless the mathematics teachers give their support with an equally bold and imaginative reform.

I have taught mathematics to higher secondary pupils for fifteen years in the four continents. In all western countries the over-riding demands of science have long been recognized, and the mathematics and science syllabuses have been co-ordinated. Secondary school mathematics is devoted entirely to those skills and topics which are useful to science. A student proceeding to his B. Sc. course at the university is already well-grounded in the mathematics required for physics, chemistry, engineering or commerce. In the school also, science teachers have not to bother much in giving the mathematical concepts to students which are necessary for understanding of science. The time thus saved is utilized for practical work in science.

Having come to India, I find, to my amazement, that the mathematics syllabuses and textbooks are still living in a Victorian ivory castle. I use the word 'Victorian' advisedly, because they were laid down by British Directors of Public Instruction in the palmiest days of the Queen Empress. It is ironical that whereas the departed British have modernized their own system, the free Indians are still slaves of their antiquated legacy. They are still treating mathematics as the dilettante Queen of the Arts, a luxury which a modern progressive country cannot afford. Mathematics today is the work-a-day servant of the sciences. Our optional mathematics pupils are not preparing to be pure mathematicians, as they were a hundred years ago, but engineers and professional men in the service of their country.

Western educationalists no longer recognize the conventional division of mathematics into arithmetic, algebra, geometry, trigonometry, etc. They consider instead only the two basic concepts of number and size. The present-day syllabus in western countries is based on textbooks of general mathematics in which the old divisions have disappeared. In the middle school classes six to eight, two lines of development run parallel. Firstly, decimals, leading to approximation and degrees of accuracy, use of four-figure tables for squares, square roots and reciprocals, and so to logarithms as a labour-saving device. Secondly, fractions with the emphasis on the important conception of ratio and proportion, leading to similar figures, scale drawing, areas and volumes, geometry and trigonometry. The first of these lines develops an understanding of number the second of size. All other topics and skills are regarded as serving one of these two main themes. The literal symbolism of algebra, and the visual symbolism of graphs, are valuable only as tools. They must be mastered adequately to enable the student to work efficiently with them, but they are not studies as ends in themselves.

Thus a pupil in a secondary school in Britain, America or Russia starts his preparation as a scientist in the sixth class mathematics periods. A thorough mastery of decimals (horribly neglected in India) is the basis of his arithmetic, and a grasp of ratio and proportion lays the foundation for geometry and trigonometry. He learns to use four-figure tables rapidly in order to save time, and finds out about practical degrees of accuracy and permissible margins of error. In algebra, he learns to solve simple equations, to translate problems and statements from language to symbols and *vice versa*, and to substitute in formulae. Practical work is done wherever possible, with models, diagrams, maps and globes, and with field work. The class will go outside to find heights and distances of buildings, trees, etc., by simple angular measurement and scale drawing. In the eighth class, the foundation of ratio and similarity is built on in the form of trigonometry. The students repeat the outside results with less work. They exclaim, "What a marvellously useful and interesting thing trigonometry is!" Even those not gifted with great academic ability will be stimulated by such interest, and will soon become adept at solving all the practical problems that trigonometry facilitates.

Their Indian brothers in the meantime, shackled to their antiquated textbooks, are wading through endless exercises on fractions, harder fractions, factors, harder factors, equations with number of unknown quantities, and in geometry, the cold and formal logic of Euclid. They are introduced to trigonometry by a right angled triangle drawn on the blackboard, and the six ratios have to be memorized. They then arrange and rearrange the simple relationships between the ratios, to form an endless succession of fancy formulae. Any one who does not understand what it is all about must learn it by heart. They are given no inkling that the subject may be of any use, and are carefully protected from the knowledge of the existence of tables. By the time a student finds out, at the university, that he must actually use trigonometry to solve problems in physics and engineering, he will have developed a hatred, or at least a scorn for the subject which he will find difficult to overcome.

"Such a method", writes W.W. Sawyer, "turns our students capable of doing certain tricks, like performing dogs. It is fundamentally degrading. It enables them to pass examinations in subjects which they do not understand, and to qualify for posts in which they will be unhappy and inefficient."

When the Spens Report, published in 1939, made the new approach to mathematics the official policy of the British Government, there was a strong rear–guard action from the older generation of mathematics teachers. They poured scorn on the new emphasis of utility and interest. They maintained that mathematics should be taught only as a discipline, that the convolutions of higher algebra, trigonometrical formulae, and Euclid train the mind in 'disciplined and orderly thinking, to recognize valid evidence, and to deduce systematically the unknown from the known'. They regarded the use of four-figure tables as wicked pampering and inducements to idleness. To teach mathematics only for its utility, they said, is to debase it from an exquisite art to a tawdry drudge. I am fully aware that these sentiments find echoes in the minds of many Indian teachers, and that a similar opposition will be encountered here to any enlightened reforms.

It is possible that another objection to the new method lurks unacknowledged at the back of their minds. The old system is so easy to teach. Everything is clear and methodical. Textbooks are full of orderly and well-graded exercises, which make marking simple and soon finished. (How many mathematics teachers have wept crocodile tears at the sight of their history colleagues carrying home a load of essays?). The new method demands greater things of the teacher, initiative, energy, and imagination. He cannot stagnate among formulae and theorems in the convenient and musty pages of a textbook. He must be alive to new ideas, practical methods and demonstrations, interesting explanations, and endless inventiveness. Science teachers are already expected to have all these qualities, and mathematics must now be regarded as a branch of science. In the last twenty five years, a new generation of such teachers has grown up in England and other countries.

Modern educationists reject entirely the idea that disciplined and orderly thinking is less effectively developed by interesting and useful work, then by plodding through involved exercises. What could be a better training for 'deducing the unknown from the known' than finding the height of a hill by trigonometry? The objection to the use of labour-saving devices such as logarithms may have some validity in an ivory castle. But in a country desperately in need of scientists, a secondary school mathematics classroom is not an ivory castle. It is an armoury. The Russians have no such scruples. They introduce not only tables and sliderules but also electronic computers into their secondary schools.

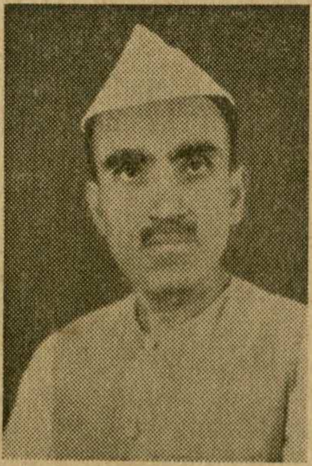
The greatest mathematicians, from Euclid to Einstein, have regarded their work as the servant of science. The Scottish genius John Napier (a member of my own University of St. Andrews) nearly three hundred years ago invented the two greatest labour-saving devices in history, logarithms and trigonometry. They made possible the Industrial Revolution and the 'great leap forward' in scientific knowledge since that time. That is the proper function of a mathematician. He is the tool-maker of the scientist. A carpenter is not expected to make his own planes and lathes, nor should a physics teacher be required to teach decimals or the calculus.

The Indian schools devote a great deal of time to fractions, both in arithmetic and algebra, sometimes of the most complicated nature. Old-fashioned teachers claim all sorts of virtues for these abstruse exercises, which may or may not exist. But even if their claims are valid, they cannot be entertained at the expense of more useful work. If a pupil knows how to add, substract, multiply and divide, say three-eighths and five-sixths, he knows all he needs to know about fractions. In later stages they are used only as a convenient form of writing a ratio or 'divided by'. Decimals, on the other hand, are of vital importance to the engineer, the technician, and the business man. The decimal system of weights, and measures, introduced into public life in India over four years ago, is making very slow progress. The absence of up-to-date textbooks is admittedly deplorable, but it is not an adequate excuse. Any teacher worth his salt is not a slave to his textbook but its master. He will use his imagination and take the trouble to manipulate the exercises to his own requirements. Until all schools, secondary, junior and basic, devote more time to decimals, the advantages of the system to the country in terms of time and money will never be realized.

The higher algebra done in this country in the tenth and eleventh classes consists mainly of topics and exercises done for their own sake. The most useful of algebra skills, that of translating statements and problems from words to symbols and *vice versa*, is largely neglected. Higher algebra and even more so trigonometry, as an end to itself is beautiful but useless, like a Hollywood film star. It is a luxury which a poor country cannot afford. The only part of the Indian syllabus which shows signs of realism is the compulsory mathematics laid down for non-specialists in classes nine and ten. This includes areas of walls, floors and paths, volumes of rectangular blocks, conversion from the old to the decimal system, percentages, profit and loss, simple interest, averages, ratio, statistical graphs—all useful topics in every day life as well as in science. If teachers of these classes restrain their enthusiasm for higher algebra and confine themselves to this simple and useful programme, the compulsory mathematics course may well give even the specialists a better grounding for their future scientific studies than the present optional syllabus.

In Western countries, the specialist students of the senior school, classes nine to eleven, build on the solid foundation of number and size which they have acquired in the middle school. The number concept leads on to such topics as progressions, infinite series, compound interest by logarithms, the binomial theorem, and exponentials. The size concept is extended to the geometry of the circle, Pythagoras theorem, and the geometry and trigonometry of simple solid figures, spheres, cubes, cones, etc. Graphs are increasingly used as visual aids, to solve equations of all degrees, and especially those which help pupils to understand basic ideas, such as the sine curve, parabola, hyperbola, logarithm and exponential curves. (The Indian syllabus concentrates on the co-ordinate geometry of the circle, which is of very little practical use). The distance-time graph introduces the new concept of time, which leads on naturally to the differential calculus. In the mathematics classroom also is done the donkey-work of physics, substitution in formula, and thorough practice in speedy use of tables for rapid working, and also the first principles of statics and dynamics.

When this type of syllabus is introduced in India, and put into the hands of the new generation of teachers, the pupils will learn with interest and enthusiasm. They will know that they are studying not only to pass examinations, but to equip themselves for their future careers and for the service of their country. Until that time we are forced to continue to teach the antiquated stuff from our antediluvian textbooks, our enthusiasm frustrated, and our potential largely wasted. I make this appeal and challenge to the authorities. Give us a mathematics syllabus into which we can infuse life and zest, which we will enjoy teaching, and our students will enjoy learning. We will in return give India the scientist skilled, enthusiastic, and dedicated, whom she so urgently needs if she is to take her rightful place as a great nation in this scientific age.



14

TEACHING AND LEARNING OF MATHEMATICS

K. R. SHAH

In the world of the scientific age every nation tries to achieve the economic and cultural progress with the help of different plans. Moreover great importance is attached to the quantitative as well as the qualitative aspect of things in every field of life. So we cannot afford to be indifferent to the learning and teaching of mathematics. The need to get to the root of things, a broadening of the concepts of algebra and geometry, the role of statistics in the treatment of probability and other effects of modern mathematics—all demand a change in our outlook to fit our courses of study to the new mathematical concept emerging out of them. It is necessary to re-evaluate the processes of the current computation and to give emphasis to the use of logic and ability of taking decisions in every day affairs. Moreover, we have to solve the many difficulties that we confront in school. A brief enumeration of these would include:

1. The number of students is increasing constantly on account of mass

education. The number is overflowing in every class and each class shows a great hiatus of individual differences in abilities, interests and social background.

2. There is a paucity of teachers having necessary educatinal qualifications, competence and training.

3. The courses of study and textbooks tend to keep teachers and pupils in a uniform mould instead of inspiring a new outlook, through practicability of courses and necessary variations therein.

4. The examination-centred outlook of pupils, teachers, administrators and parents is a great hindrance to the realization of the true objectives of learning.

5. A burden of the study of three to four languages takes away a part of time necessary for the learning of mathematics.

6. Pupils are indifferent to the learning of mathematics due to option of dropping it at the S.S.C. examination.

7. More use of the lecture method has made the teaching of mathematics uninteresting.

8. The expenditure of time and energy of the teacher of mathematics in private tuitions after school hours has harmful effects on classroom work.

Effective Learning and Teaching

Now I shall place a picture of effective learning and teaching in a bare outline. I believe that effective learning of mathematics would help pupils to

- acquire a *clear concept* of the mathematical principles, procedures and terms;
- acquire *the understanding* of fundamental processes and *skills for their* use.
- search out *the fundamental relations* and *the functional relations* amongst numbers, forms, etc., and understand and use them;
- form an outlook of *the cause-effect relationship* during learning and obtain intellectual independence;
- learn to distinguish between relevant and irrelevant data during the struggle for solution;
- train *power of thinking*: (a) reason by analogies, (b) think analytically and synthetically, (c) place a serial chain of thoughts inductively or deductively and (d) think by comparison to discriminate differences of values.
- *develop inquisitiveness to understand the quantitative aspect of material* environment and obtain necessary skills for the same;
- *develop inquisitiveness to understand the quantitative aspect of social* environment and obtain necessary skills for the same;

— form certain attitudes as (a) to go to the root of things, (b) to abstract generalizations and further generalizations, (c) to promote self-confidence (d) to form an attitude of self-help in fighting against hardships and to train patience, (e) to promote an attitude of continuous effort, (f) to accept the result after testing it, etc.
— form a habit of concentration, absorption and the continued attention;
— form a habit of a clear, concise, exact and neat presenting;
— incline more towards the attitude of securing the skill of learning than acquiring the quantity of knowledge;
— enhance interest towards the curricular and the co-curricular aspects of mathematics during learning.

Effective teaching constitutes individual and institutional endeavours to create a proper atmosphere to help pupils achieve the above points of effective learning.

Now we shall think of the ways and means for their achievement. These relate to the administrative and teaching methods and attitudes and are covered briefly in the following pages.

Administrative Measures

BIG CLASSES HAVING A VARIETY OF ABILITIES, INTERESTS, ETC.

1. *Arrangement of a variety of courses of study*: In big classes having a variety of abilities, interests, etc. pupils with low I.Q. may also join. Technical material and audio-visual aids may be planned to fit with their abilities. In the same way other coordinating courses according to their level may be arranged for the pupils of high I.Q.

2. *Classification in homogeneous groups*: Pupils should be distributed in two or three homogeneous classes, e.g., the backward, the mediocre and the talented according to the capacity of the school. This arrangement has proved successful in practice in many places in America although on psychological grounds there are certain objections to it. Butler and Wren have noted in *The Teaching of Secondary Mathematics*, 'Homogeneous grouping has been used for a number of years with apparent success in many of the larger cities, and there is reason to believe that its acceptance as a sound principle is increasing rather than decreasing'. A separate arrangement of teaching and testing in such homogeneous groups is also necessary for better results. It is not only that backward pupils can easily obtain forty per cent marks in elementary mathematics at the S.S.C. examination at the end of the study of five or seven years under such arrangement, but more significantly one or two years of their education can be saved. There is no provision for the backward as well as the talented in our present administration.

Perhaps this may be one of the reasons for the lack of interest among our students and this may also be one of the causes of indiscipline among them.

3. *Homogeneous classfiication for the subject*: For mathematics which requires the utmost individual help, classification into homogeneous groups seems to be necessary. Perhaps it is not difficult to plan it in a class with 50 pupils. It may involve a little expenditure but it is worthwhile spending money for such a cause whose output, in terms of gain to the society and to students, should be a worthy return.

4. *Differentiated assignments*: Three types of assignments havin easy exercises, harder exercises and exercises for the talented should be pi pared. These exercises can be used with advantage in any kind of class—whether it consists of homogeneous groups or whether it is as a whole a hetrogeneous group.

COURSES OF STUDIES AND TEXTBOOKS OF THE SAME OLD PATTERN

(a) *A variety of courses*: Three of four kinds of courses should be prepared with the help of experts and schools should be given the chance for selection.

(b) *A course of studies in sections*: The course of studies should be given in two sections, one having an outlook of gradation and continuity and the other having scope for free development. A few different plans of the course-sections with a scope of free development should be prepared and discussed in workshops and a continued contact of advisers should be kept with the institutions for the implementation of the plans fitting to their situations.

(c) *Experiments for the change in syllabus*: Experiments from the point of view of objective outlook by expert and zealous teachers should be carried on in about five per cent of the school and the necessary units and their necessary phases should be covered within the planning of three to four years.

It is likely that the textbooks as they obtain at present may not be changed for sometime. The following suggestions are made in respect of the courses of studies in such textbooks.

Points pertaining to the reforms of textbooks.

- Proper attention to the grade and abilities of pupils
- The view of the fields of pupil-interest
- The real material and social situations for the use of mathematical knowledge
- Matter relevant to the achievement of objectives of 'the effective learning'
- Carefully graded exercises

- A plan of exercises for the backward, the mediocre and the talented pupils
- A few exercises of mixed examples together with separate exercises for different aspects of the unit.
- A clever use of games, pictures, stories, dialogues, etc., from the objective-centred point of view and the stimulation of interest
- Incorporation of amusing answers and interesting problems
- Useful suggestions for the mathematical experiences and experimental work and guidance about the aids
- Elimination of useless lengthy calculations
- Planning for the habit of checking
- Revision of previous knowledge and connecting new knowledge
- Diagnostic tests
- Planning of the review sections
- Revision tests at proper intervals
- Practical suggestions for the units of study with a scope of free development.

THE EXAMINATION-CENTRED OUTLOOK

Objectives, learning experiences, instructional activities and evaluation —all three depend on one another. It is clear that the practice of objective-centred evalution will naturally bring proper changes in the teaching activities and methods. If the present examination system is not changed, it is possible that between two teachers of equal abilities, the examination-minded teacher may bring about apparently better results. It is an undisputed truth that the present examination-centred outlook is a great hindrance to the attainment of objective-directed learning and teaching.

The Burden of Four Languages

In comparison with other nations, this burden as well as the attitude towards this side puts a good deal of cut into the learning time for mathematics. A cut of about an eighth of the time is found in our schools in the teaching of mathematics in comparison with that of the schools in U.S.A. We have to remain satisfied with a little low standard under these circumstances. A few aspiring pupils can make up for this deficiency to a certain extent during their college career. Hence our major objective would be to arouse the mathematical outlook and interest.

The Option of Dropping the Subject at the S.S.C. Examination

We should abolish this option. A question paper should be planned in such a way that common examinees would easily get success in a part of it, the other part being set in such a way so that it may discriminate between those who are good in their ability and those who are poor. The syllabus should also be useful in the daily life. Only then we shall be able to create an atmosphere to encourage interest in the pupils.

An extra question paper of this subject should be kept for the talented students. Moreover, we should take various steps to create an interest and attraction to offer this paper. The syllabus for this paper should be framed from the viewpoint of preparing the background for the higher courses of mathematics. Moreover the success in this paper should be compulsory for admission to mathematics courses of this college.

The Tution Practice

This problem can be solved by keeping coaching classes in the schools, distributing the remuneration equitably amongst the teachers, giving other opportunities of earning to them, and explaining the evils of tuition practice to parents.

Mathematics Clubs

The mathematics club is useful for the following purposes:

- spoting pupils having deep interest in mathematics,
- to arouse an attitude for research,
- to keep a continuity of interest,
- to provide for the deficiencies of class-teaching,
- to study minutely the interest and attitude of learning the subject.

Teaching Measures

Preview and the Measures for Motivation and Interest-stimulation

It is necessary to have a knowledge of pupils' interest, level, abilities and the previous knowledge pertaining to the unit. We can use oral or written tests for its exploration.

It is necessary to strive to achieve a practicable environment of place, time, aids, etc., suitable to the unit.

Any problem that is presented places an individual in a state of perplexity, uneasiness and tension until the solution is arrived at. The solution of the problem gives peace and satisfaction. Mathematics, an inexhaustible spring of problems, when properly taught with clear thinking together with useful techniques, gives opportunities of success. A chain of such experiences and the power of methods, sharpness of tools and the experiences of achievement create the real source of stimulation and maintenance of interest.

We can make use of the following external aids relevant to the unit for the stimulation of interest. (a) Possibilities of connecting the unit with the life-experiences of pupils, (b) Problematic areas inspiring curiosity, (c) Inter—weaving of gams and competitions, (d) Use of the amusement aspect, (e) Audio-visual aids to inspire interest and engage different senses, (f) Planning of free and selected activities for the pupils, (g) The historical aspects of the subject, and others.

EXPERIMENTAL WORK AND OTHER ACTIVITIES FOR GAINING EXPERIENCE

For affective learning it is necessary to make three dimensional geometric models and diagrams, to draw, to colour, to measure, to cut, to note down, to compare, to classify, etc., with the help of concrete materials like card-board, straw-board, graph papers, papers for using one side, etc., and at a higher stage to gain experiences about various abstract statements. Various diagrams on graph papers and their multi-coloured parts provide interesting and useful experiences for the study of simple and decimal fractions, percentage, average, mensuration, etc. Multi-holed short and long strips and bolts of a meccano provide a good store of experiments and research experiences for constructions, properties and relations of different triangles, polygons and three dimensional bodies. Objects of different shapes such as a cube, cuboid, cylinder, cone, etc., and different figures such as squares, rectangles and triangles, etc., provide various experiences and a store for experiments for the study of factors, expansions, square root, cube root, the theory of Pythagoras, mensuration, etc. Apparatus for the teaching of mathematics used in the Montessory system also provides experiences for the understanding of many concepts, principles, etc. The students should carry out not only the given or suggested experiments but also take interest in free experimental work of different types.

DIFFERENT PUPIL-TEACHER ACTIVITIES AND THE WARP AND THE WOOF OF QUESTIONS AND SUB-QUESTIONS

It is very important to understand clearly the fundamental concepts, principles, processes, mutual relations and functional relations, etc., of mathematics. Some points should be specially kept in mind in developing the pupils' outlook.

Pupils should connect cause and effect at every step and obtain intellectual independence.

They should arrive at the points of data from the points of the required answer educing with the help of analytical questions, and reach the answer ro conclusion using them in an orderly and connected manner. In the eighth or ninth grade when this habit is in its initial stage the help of a partly helpful table may be given for this step or orderly completion. As the time passes, pupils should be trained to do everything themselves.

Pupils educe general truths, rules, etc., from the experimental work or a chain of experiences at the end of useful arrangement or classification, comparison, etc.

They use the deductions under other circumstances.

They arrive at conclusions with the help of analogies where necessary.

They learn to think by comparison to discriminate differences of values and take decisions relevant to the circumstances.

We have to use the second and the fifth types sparingly where necessary for the grades five to seven and use them often in the higher grades.

Moreover we should at times inspire suggestions to carry over these thinking habits into the other fields of life and draw attention with concrete examples on proper occasions.

PRACTICE AND DRILL

The engrams of useful and interesting experiences are accumulated in three phases of mind—cognition, affect and canation i.e. skills, concepts, attitude and habits are formed by a series of repetitions of such experiences. So the part played by drill is very important for successful learning. With the help of drilling, the concept, attitude and habit becomes deep and long-lasting and turns out profitable for the recall.

Drill work should have

- Objective-centred and interesting activity
- An element of newness in activities
- Scope for playway and amusing activities according to the level of the class
- Planned, graded assignments inspiring stimulation by success and providing work as per the abilities and speed of pupils
- Assignments enabling checking wherever possible and having convenience of the self-evaluatinn of progress
- Drill units really useful for the present or the future life of the pupil
- The step of drill being carried out by self-helping assignments for pupils at the end of a brief revision of the basic understanding of the matter and the teacher, at this time, moving about for individual help and inspiring stimulation giving only the bare necessary help. (The drill work contains the classwork and the home work as well), and
- Drill lessons being kept short and the intervals between the recurring revisions gradually increasing

REVIEW AND RECAPITULATION

This is a step to *create an organized, coherent concept* by a general review at the end of the unit to establish relationship of the sub-units, to each other and to the whole. During this step we may utilize four types of corelations (a) with the life, (b) with other subjects, (c) with other branches of the subject, and (d) with other units of the same branch. As far as possible, the correlation should be natural.

TRANSFER OF LEARNING TO THE PHYSICAL AND SOCIAL FIELDS

For this purpose learning to solve a problem pertaining to the quantitative aspect of the field of the material world or human life relevant to the level and interest of pupils is necessary. For the attainment of this transfer the section of the course with a scope of free development should be utilized.

The pupils after choosing a real problem from life from the psychological point of view:

- —obtain a clear concept of the field of the problem,
- —learn to plan their work,
- —determine the workable hypothesis by analysing the environment,
- —learn to collect necessary details from real places and individuals,
- —learn to value the proportion of truth of the matter collected,
- —learn to classify and collate the collected matter,
- —learn to present the collected matter in different ways such as tables, graphs, pictures, variables, symbols, etc.,
- —learn to work co-operatively,
- —learn to decide by group discussion,
- —examine the workable hypothesis in view of the collected material,
- —take a decision for one or more solutions, and
- —learn notes-taking, organized oral and written presentation and other aspects for expression.

We can devise such projects at intervals for the transfer of learning.

The main aim of such project is to prepare pupils to use in practical environments, the mathematical knowledge, attitudes, skills etc. achieved by them. It is neither possible nor necessary to give the vast inheritance of the knowledge and skills of mathematics as those of other modern sciences. We have to keep in mind the purpose of giving them a training in the art of learning so that they can obtain the necessary knowledge and skill when needed.

DESIRABLE ATTITUDES AND DEVELOPMENT OF INTEREST

We should constantly attend to the achievement of the attitudes and the habits shown in the effective learning section throughout the working of all the above six steps. Moreover we should be careful to arouse interest and to increase intrinsic interest towards mathematics in the minds of pupils. A little neglect in this matter in the initial stages brings for us a lot of difficulties at a later stage.

MEASUREMENT AND EVALUATION OF THE ACHIEVEMENT OF OBJECTIVES

It is also a very important step to prepare and use the objective type and other types of tests to see how far the objectives have been achieved. As a result, we can take necessary steps to remove rhe deficiencies found in the achievement of different objectives and can make learning and teaching more effective.

Now we shall consider the importance of the above steps pertaining to some of the main fields of learning and teaching of mathematics.

Constant and variable numbers, their properties and fundamental processes: The fourth step is specially important after arousing understanding by steps 2 and 3 in the learning of this field. We should achieve 100 per cent skill of computation useful in our daily life and we should eliminate such items as big multiplication and division and simplification of intricate fractions.

Fundamental relations and functional relations pertaining to number, form etc: For the learning of this field steps 1 and 2 in general and step 3 in particular are important. At a later stage the fifth step is also useful to some extent.

Logical thinking and relational thinking: Mainly steps 3 and 5 are very important for the learning of this field.

Presenting the matter: (With the help of tables, different graphs, using pictures, using unknown or variable letters, etc.)

To some extent step 4 and mainly step 6 are important for this field.

Heritage of good behaviour: As regards the heritage of culture, the heritage of good behaviour is more important than that of knowledge and skills. To achieve that it is very necessary that we keep constantly in mind the step 7 during the activities of our different steps.

Preplanning of the whole unit is very necessary for the proper use of all these steps. While planning we should keep in mind the following points:

—previous knowledge,

—objectives,

—activities and aids,
—pupils' and teachers' contribution,
—graded and varied plans and assignments of work for practice,
—expected difficulties and prethinking of ways of dealing with them,
—ways and means of stimulating and maintaining interest,
—bare necessary guidance to lead them towards the process of analysing,
—possible natural correlations out of the four types of correlations.

2. Moreover we have to bear in mind that effective learning is possible if we keep in mind the age, level and abilities of pupils.

3. This plan can only be implemented if the teachers realise that the main objective of teaching is effective learning on the part of his pupils and effective teaching on his own part.

We have to think how far we can turn the theory discussed above into practice. This indeed requires inspiring and attractive facilities for the realisation of our purpose.

ASSESSMENT AND EVALUATION

PART III

15

AN EXPERIMENT IN EXAMINATION

M. BENJAMIN

THE PROBLEM of the evaluation of learning or, in other words, the problem of examinations, has always been a controversial one. The traditional essay type of examination has been found rather unsatisfactory, and its limitations are well known. Scientific investigations have proved that these examinations are frustrating and extremely unreliable for the evaluation of pupils' achievement and abilities. To quote the words of an expert: 'The failure to restrict essay testing to the purposes for which it is best suited has resulted in lost efficiency, time and effort and also in lower validity of evaluation.'

It was from such an understanding that the Alexandra Girls' Institution, Bombay, undertook an experiment in examination and has been working on it since 1958.

Aims

The aims of the experiment are to evolve a system of examination which will examine a wider field of knowledge, which will examine in a more intelligent way, encourage correct methods of study on the part of the pupil and eliminate cramming, reduce the subjective element in the marking of the teacher to a minimum, thus making evaluation more valid and reliable.

Procedure and Material

In order to achieve these aims it was decided to make use of the new-type examinations and compare them with the results of the essay type. The new-type examinations are of the two kinds: (1) The objective one-word tests, and (2) the short-answer one or two sentence tests.

The experiment aimed at finding the difference in the achievement of pupils in the objective one-word type of examination, and in the short-answer tests. It also compared the achievement of pupils in the objective tests and short-answer tests with their achievements in the essay type of examination.

It must be made quite clear that the pupils in the school have tests in each subject roughly once a term, i.e., two tests a year in each subject, and two examinations, one at the end of the first term, and one at the end of the academic year. Subject tests are held once a week.

The experiment was carried a step further. The subject teachers were made to rank the pupils in the experimental classes according to their estimation. These rankings were given in a sealed envelope to the principal some time in the middle of each term and were done without consulting the marks obtained by the pupils in their tests or examinations. The ranks of the pupils as obtained in the tests and examinations were then compared with the teacher's rankings. It was not easy for the teacher to rank a class of about 35 pupils according to his estimation. A five-point scale was utilized: A+, A, B+, B and C. An A+ indicated excellent, and C below average. The class was first divided into these groups and the ranks were then given to the individual pupils.

The rankings were done not only for the experimental classes which were given the new-type examinations but also for the 'control class' which was getting the usual essay type of tests and examinations.

The classes chosen in 1958-59, the first year of the experiment, were standard VII sections A and B. Each of these classes were given the objective one-word test in one term and the short answer test in the second term. The results and achievements of pupils in both types were then compared. In the second year 1959-60, these two classes were in standard VIII. These same pupils were given the traditional essay type of examination and their achievements in these compared with their achievements in the new-type tests which had been given to them the previous year.

This experiment was repeated in 1959-60. Standard VII was given the objective-one-word type of test in the first term and essay type in the second term.

The New-type Examinations

It will not be possible to give anything but a short account of the new-type examinations and tests here. A few sample papers given in Appendix I will help to clarify this description and will give one concrete example of how these tests are to be constructed and how they can be made foolproof. Experiments and research have shown that the traditional essay type of examination is incapable of appraising accurately either the pupils' knowledge or their mental operations. We feel that the new-type tests are a definite improvement, less of a strain on the pupils, and a more effective method of evaluation.

The main difference between the essay type of examination and the new-type is that in the latter there are a larger number of questions set, to be done in a shorter term.

OBJECTIVE ONE-WORD TEST

In the one-word type, the number of questions set may be 75 to 100 for a paper of about one hour. The most important factor in this type of test is that the answer to each question must be a definite word, letter or a number, and there should be no ambiguity about the answer. One mark is given for each answer. This makes the marking and evaluation mathematically accurate. In a test like this, if carefully constructed, the scoring cannot vary even if it is corrected by a number of examiners. There is, of course, a certain element of guess-work on the part of the pupils, but this can be reduced to a minimum. There are also greater chances of copying, but this problem does not arise in this school where classes do not normally exceed thirty-five pupils, where supervision is satisfactory, and where copying is considered a serious misdemeanour.

The new-type tests which we have used fall into five categories. They have proved suitable for testing not only the knowledge but testing and measuring comprehension, reasoning, selection, memorization, inference and discrimination. These five categories do not achieve all these things, but if the question papers in Appendix I are studied carefully, they will illustrate what each type tests are. The five principal types of the tests are as follows:

THE MULTIPLE CHOICE TEST

This consists of two parts, the 'stem' which is the main problem, and the answer. The stem must be clearly, simply and precisely worded and must be well within the pupils' understanding. It must contain only one problem and must take the form of a question or an incomplete statement. The answer required should be only one of the number of alternatives offered. Usually five choices are recommended to reduce the chance of guess-work, though three may also be utilized. These alternatives are known as 'distractors'. Selecting distractors can be very interesting to an examiner. They should be plausible, not too lengthy; they should all be more or less the same length; they can be made more effective by using the language of the textbook and they can often be the incorrect answers given to a question in class by the pupils during a routine lessno. (See question papers in Appendix I.)

The Matching Test

This consists of two columns, one on the left hand side called the 'stimulus' column and the other on the right hand called the 'response' column. Items in both these columns should be homogeneous. Each item in the stimulus column is to be paired with a word or phrase in the response column. This matching test is useful for several kinds of questions—laws and their illustrations, rules and examples, tools and their uses, events and places or persons and dates, symbols with their names, parts with units, causes with effects, terms and their definitions, principles with their applications, means with ends, experiments with results.

True-False Test-Items

This is sometimes known as the 'alternative response' test-item. It consists of a statement of a declaratory and categorical nature and the pupil is required to state if it is right or wrong. It is extremely important that there should be no ambiguity in this statement and it should not be of a too general, involved or trivial nature. It should contain one single idea and may have a qualifying clause. This type may take more complex forms if administered to the senior classes, or it may even be modified. In this type the pupil is asked not only to mark the items that are true, but to modify these false or incorrect items by identifying the word that makes the statement false or incorrect and writing another word that would make it true. These true-false items can take several other forms.

The Completion Test

This consists of a statement in which an important word or words are omitted and the pupils are required to fill in the blank, or a statement is made and it has to be cnmpleted.

This again can take more complicated forms where pupils are required to consider two blanks at the same time and the suggested choice is also in pairs.

THE ANALOGY TEST

This usually takes the form: 'A is to B as C is to...?'. The pupil has to first understand the relationship between A and B, and then recognize the word or phrase that has the same relationship with C. The nature of the relationship between C and the answer should be the same as that between A and B.

It is useful for testing pupils' recognition of relationships between words, ideas, theories, facts and principles. This is a slightly more difficult type of test-item and should be utilized only for the senior classes.

The manner in which the pupils are to answer and deal with each of the five categories of test-items mentioned above is obvious from the question papers in Appendix I.

This type of examination involves a number of questions about 25-30 which can be answered in about half an hour, as against the three or four which have to be answered in the same time in the essay type. These questions will involve answers of one, two or three sentences only. Thus it is obvious that this type of examination can cover a wider range of knowledge than the essay type. The questions in this type of test should be short, pointed and on specific topics.

The evaluation of this type of test is done by giving one mark for each sentence of the answer. We have restricted our short-answer tests to questions which involve only one-sentence answers.

Evaluation

The tables given in Appendix II will illustrate how the experiment has worked out and what results and conclusions have been arrived at from the pupils' achievements.

Pupils' Reactions

The pupils were entirely new to the objective and short-answer type of tests. The principal had an informal talk with them about these tests and the following reactions were noted:

In standard VII-A, 20 out of 26 pupils preferred the objective one-word test in the short-answer one-sentence test. As against the traditional essay type of examinations, 20 preferred the objective one-word test to the essay type and all the 26 preferred the short-answer one-sentence type to the essay type. Some of the arguments advanced by the pupils were: The average and below-average pupils felt that it was easier to pass the new-type examinations, while the better and more intelligent pupils felt that new-type tests did not give them enough scope to show their abilities.

In standard VII-B, out of 28 pupils, 24 were in favour of the objective one-word test and four against. In this class, the majority preferred the traditional essay type to the short-answer one-sentence test. Their arguments against the short-answer one-sentence type were: (1) They found the paper rather lengthy and they did not have enough time to think. (2) They found it difficult to switch their thoughts quickly from one topic to another in a limited amount of time. (3) They found it difficult to condense their answers into one sentence. (4) They felt there were more chances of losing marks in spelling and grammatical mistakes in the short-answer one-sentence test.

We can conclude from the above that both divisions of the experimental class preferred the objective one-word test to the short-answer one-sentence type. In one division, the majority preferred the short-answer to the essay type, while in the other division it was just the opposite.

Even the results showed that the pupils scored higher marks in the objective one-word than in the short answer one-sentence tests.

The teachers felt that the objective one-word tests definitely gave some of the pupils an advantage, and the not-so-bright pupils who would normally have failed in the usual essay type of examination had passed in the new-type test.

Experiments in 1960-1961

A. The experiment begun in 1958-59 was worked for a third year, the experimental class this year being standard VIII: For the first term tests and examination they were given new-type short-answer one-sentence tests and for the second term tests and final examination they were given the traditional essay type tests.

The results of these are given in Appendix III—Tables I and II. They are also compared with the achievements of these very pupils when they were in standard VII (see Appendix II—Tables III and IV).

B. The experiment referred to in Table III of Appendix III which was re-started with a new class in 1959-1960, was carried on for a second year in 1960-1961. A minor variation was introduced. Instead of choosing one class for comparing the achievements of pupils in different kinds of tests and examinations in all the academic subjects, three classes with one subject for each were selected. This variation was not fundamental. It was introduced only to eliminate any vitiating factors that may have crept in during the previous years.

The classes and subjects for experimentation were as follows:

1. *Standard V. Subject: History.*
   1st term tests and examination: Short-answer one-sentence tests. 2nd term tests and final examination: Objective one-word tests.
2. *Standard VI-A and B. Subject: Geography.*
   1st term tests and examination: Short answer one-sentence tests. term tests and final examination: Objective one-word type for standard VI-A and short-answer one-sentence type for VI-B.
3. *Standard IX-A and B. Subject: General Science.*
   1st term tests and examination: Objective one-word type for standard IX-A. 2nd term tests and final examination: Essay type. 1st term tests and examination for B group: short-answer one-sentence type. 2nd term tests and final examination for B group: Essay type.

The results are tabulated in the Appendix III—Table V.

Difficulties

In order to have a balanced idea of how far this experiment has succeeded, it would be appropriate to mention the difficulties we have encountered.

The first essential for the success of an experiment of this kind was that the teachers had to be thoroughly conversant with the construction and assessment of new-type tests. With the exception of a couple of teachers, the staff in this school was entirely new to these techniques. Several meetings and discussions took place. Sample papers had to be given and detailed cyclostyled instructions issued. They had first to try out test cases in order to gauge the time required by pupils to solve the new-type test papers. Every question paper in each of the subjects taken by the experimental classes had to be submitted with answers and assessment to the principal for scrutiny, before it was administered to the pupils. These had often to be amended or even re-set at times.

The correction and assessment of the answer books was extremely important. Some of the questions to be taken into consideration were: How far can correction be made foolproof? How much of the subjective element can be eliminated in the correction of these papers, the ultimate aim being to arrive at the same evaluation of the pupils' achievements irrespective of whether teacher A or B corrected the paper? In which subject-papers should marks be deducted for spelling and grammatical mistakes? How far was the 'guessing' factor to be taken into consideration when judging the answers?

After the new-type tests were administered the teachers submitted the question papers with answers to the principal for scrutiny. Assessment was again discussed. The actual working out of statistics was entrusted to experts.

It will be seen that the biggest hurdle was the training of the teachers in new techniques. This was further complicated by the fact that the same set of teachers did not teach the experimental class the following year, so that if the experiment is to be carried out for two or three years, there will always be some teachers who are new to these techniques and who will have to be given the necessary orientation.

It would be well for teachers' training colleges and extension service departments of training colleges to include this training in new-type test technique as a part of the regular curriculum.

The main objections the teachers had to new-type tests was that it does not examine or assess the pupils' ability to write a language or their power of expression. This objection was raised by the language teachers. They felt that if nothing but the new-type tests were given to the pupils, the standard in languages would deteriorate. This was a genuine objection.

We overcame this difficulty by giving the pupils of the experimental classes a short paper of 25 marks in languages, besides the new-type test paper, in the terminal and final examinations. This short paper consisted of questions on essays, precis and letter-writing and only those questions that would test the pupils' ability to express their thoughts in writing were asked. This paper was, of course, composed of only the eassy type of questions. We were careful, however, not to include the marks obtained in this paper for purposes of the experiment and for working out the statistics.

This experiment has proved extremely interesting, but it has involved a considerable amount of extra work for the staff. A few of the staff members felt that it was a 'great nuisance' because the setting of the question papers requires a lot of time and thought, though the correction and assessment is much quicker and easier. Even these staff members are becoming more interested, however, as they gradually master the techniques of construction and assessment.

Examinations in one form or another will always remain, but research and experimentation, over a long period, can evolve a type of examination that will be a satisfactory and foolproof method of evaluation of pupils' achievements and the acquisition of knowledge.

General Conclusions

A detailed study was made of all the results of the experiments described here and which covered a period of three years. It may be mentioned that, as a final check, random samplings of marks obtained by the pupils in various subjects in tests and examinations were selected for study. It is not possible to give these statistics in detail here, but they are available for anyone who cares to study them. It was found that the study of these random samples yielded roughly the same observations and conclusions as the statistical results of the actual experiments. The conclusions are given below:

1. The range of marks obtained by the pupils in the objective one-word tests was usually small. It was greater in the short-answer and one-sentence type, and the greatest in the essay type of examinations
2. The mean scores were higher in the objective one-word type than in the essay type. This indicates that the pupils do much better in the objective type than in the traditional essay type.
3. Comparing the one-word with the short-answer type, it was found that there was greater correlation between these two than between either and the essay type.
4. Often the more intelligent pupils scored equally well in the objective one-word and the short-answer one-sentence type tests. Again, in the case of the more intelligent pupils, there was not such a wide difference between the scores obtained in the new-type and the essay type tests.
5. Generally, the weaker pupils were at a definite advantage in the objective one-word type of examinations. They scored higher marks here than in the essay type.
6. Particular mention must be made of language papers. The scores were always higher in the objective one-word than in the essay type as marks were lost for bad spelling and poor expression in the essay type.
7. The essay type came closest to the short-answer one-sentence type.
8. The short-answer one-sentence type of tests and examinations seem to have fared best in the experiment.

As a result of these observations it was decided that a mixed type of question paper, consisting of all three types of tests, would be most suitable.

Reorientation of the School Examination System

The following examination and evaluation system has now been introduced in this school from the beginning of this academic year. The new examination scheme in the secondary school is as follows:

A. STANDARDS V AND VI

For subjects such as history, geography and general science, all tests and examinations are to be of the objective one-word and short-answer one-sentence types. In mathematics there are to be speed tests and a paper consisting of objective and essay type questions. In the language group, English (which is the medium here), Gujarati and Hindi, a mixed paper of the new-type and essay type questions will be given. Questions in grammar will be mainly of the new-type, while essay type questions will be set to test pupils' comprehension and powers of expression. The pass percentage for these classes has been raised from 40 to 45.

B. STANDARDS VII AND VIII

In all subjects except languages, 30 per cent of the question papers will be of the objective one-word type, 40 per cent of the short-answer one-sentence type, and the remaining 30 per cent of the essay type. In the language group the percentake will be as follows: 20 per cent objective one-word, 30 per cent short-answer one-sentence, and 50 per cent essay type.

C. STANDARDS IX AND X

In all subjects the question papers will be set as follows: 15 per cent objective one-word, 25 per cent short-answer one-sentence, and 60 per cent in the traditional essay type.*

The effect of these changes will be carefully watched for some years and the system will be modified if necessary at the end of each year. The results obtained by the pupils at the end of this year will be compared with the results obtained in the three previous years of experimentation.

Note: All examinations have been abolished in the primary school.

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* Standard XI is governed by the S.S.C. Examination Board Rules. It may be interesting to note that the S.S.C. Examination Board of Bombay introduced New-type tests at the examination of March 1962.

APPENDIX I

The Alexandra Girls' English Institution

ANNUAL EXAMINATION

GENERAL SCIENCE

(Specimen of an objective one-word test paper)

Standard VII B
Time: 1 hour Max. Marks: 50

1. Put a circle round the letters of the alphabet indicating the correct answer:

(i) Whole-wheat flour is usually more healthful than white flour because it (a) contains more starch, (b) contains more vitamins, (c) is darker in colour and (d) is digested more easily.

(ii) People in flooded areas are warned to boil all drinking water. This helps prevent (a) smallpox, (b) pneumonia, (c) Typhoid and (d) Influenza.

(iii) Exhaled air compared with inhaled air has in it less (a) carbon-dioxide, (b) water vapour, (c) nitrogen and (d) oxygen.

(iv) Vitamin D is specially helpful in
  (a) preventing night blindness
  (b) building strong bones
  (c) preventing sunburn
  (d) preventing scurvy

(v) Which liquid is always safe for drinking?
  (a) Creek water, (b) spring water, (c) boiled water
  (d) fresh raw milk.

(vi) Vaccination has greatly decreased the number of cases of (a) Smallpox, (b) cholera, (c) mumps and (d) bronchitis

(vii) Boiling vegetables for too long destroys valuable (a) salts, (b) sugar, (c) cellulose and (d) vitamins.

(viii) The gills of fish are used for (a) swimming, (b) laying eggs, (c) digesting food, (d) taking in oxygen.

(ix) It is easier to start a new plant by layering than by cutting because
  (a) layering is a quicker method
  (b) layering is easily done
  (c) connection between the parent plant and new plant can be kept

(d) layering can be done in any season.

(x) In artificial methods of ventilation we depend on (a) diffusion of gases, (b) winds, (c) changes due to difference in temperature and (d) fans and pumps. (10 marks)

2. Complete the following statements by filling in the blanks with appropriate words:

(i) The most abundant gas present in air is——and its proportion in air is nearly———per cent.
(ii) ————and————make up respiration.
(iii) The extra thirteenth month in the world calendar would be called————and would come between ———and———
(iv) In addition to the diaphragm, the movement of the———helps to force air in and out of the lungs.
(v) ————and————are foods rich in fat. (10 marks)

3. In the space at the right, indicate by a + sign the statement which is true and by a O sign the statement that is false.

(i) If you cannot get oranges, tomatoes are a good substitute————
(ii) The Pelton wheel is more efficient than the over-shot wheel——
(iii) The year 2000 will be a leap year———
(iv) Bombay's water-supply is chlorinated———
(v) Friction is vitally useful to us———
(vi) Plants purify the air in the day by giving out oxygen———
(vii) Scurvy is an air-borne disease———
(viii) Wheels in gear are only used for increasing motion———
(ix) Water plants have hard tissue to protect them from currents———
(x) Astronomers follow the star day———— (10 marks)

4. Match the two columns by putting the correct letter from column two in the blanks in column one.

Column I	Column II
–1. Calcium	A. Turns to sugar in the body
–2. Settling	B. Muscular partition separating chest from abdomen
–3. Vitamins	C. Builds strong bones and teeth
–4. Lubricant	D. Substance used for growth and repairs
–5. Fat	E. Substances that help to regulate the body's food
–6. Spriacles	F. Removing solid materials from water by letting it stand for sometime
–7. Diaphragm	G. Gives more energy.
–8. Starch	H. Substance used to smoothen the working of machines

Column I	Column II
–9. Water Vapour	I. Breathing holes of insects
–10. Sterun.	J. Voluntary muscle
	K. Water present in air
	L. Plants breathe through these
	M. Breathing pores on Leaves
	N. Ribs are attached to it. (10 marks)

5. (i) Label the respirator organs in the diagram given (7 marks)
(ii) Label the parts of the diagram (Diagrams were given here) (3 marks)

ENGLISH TEXT AND GENERAL

(Specimen of a short-answer one-sentence test paper)

Time: 1½ hours
Max. Marks: 75

Each sentence carries one mark

1. What was Janet's opinion of Tamlane?
2. What did Tamlane think of doing on his father's death?
3. Describe in three sentences what Tamlane saw when he was lying on the enchanted spot.
4. How did Tamlane and the fairies reach fairyland?
5. What made Janet go to the Eildon Tree?
6. State in two sentences what the custom was in fairyland which would endanger Tamlane's life.
7. State in four sentences the four different forms into which Tamlane was changed and what Janet did to get him back from the faries.
8. Why was the Gipsy Lady very annoyed with her son?
9. State in three sentences any of the three things which Miss Jessamine told Jackanapes not to do in front of his grandfather.
10. What did the General say when Jackanapes said that he had much money.
11. What did the General think of the way Jackanapes spent his money?

12. How did Jack get the money to marry Mary?
13. How did the dwarf get Jack out of his habit of talking too much?
14. Why was the tailor unwilling to give his daughter in marriage to Jack?
15. What was the curse laid upon the king's sons by their godmother?
16. What was funny about the Hatter's watch?
17. Why did Alice scold the Hatter for wasting time?
18. What is the 'Lone Dog' proud to be?
19. What figure of speech has been in the verse:
'And his tail he hold bravely, like a banner in a fight.'
20. When do we realize that the dog was very dear to the girl?
21. Why is the woodcutter a happy man in spite of his poverty?
22. What does the woodcutter advise the birds?
23. What does the poem 'A Child's Pet' describe?
24. Where were the sheep being taken to and why?
25. State in two sentences the two striking pictures in 'Sands of Dee'.
26. How does the poet add to the wonder of the poem 'Sands of Dee'?
27. What figure of speech has been used in the lines:

> 'The cruel crawling foam,
> The cruel hungry foam.'

28. Why has the poet entitled his poem 'Sea Fever'?
29. Quote the two lines which make us feel sorry for the 'Lone Dog'.
30. Quote the two lines where the woodcutter tells us about his children.
31. Quote the two lines where the poet says that he cannot resist the call of the sea.
32. Who was Dick Turpin and what was the name of his horse?
33. Where is the Poet's Corner?
34. What was the Tower of Babel?
35. When is a person said to have put the cart before the horse?
36. When is a person said to have locked the stable door after the horse was stolen?
37. When will you say to a person: 'Go and tell that to the marine'?
38. What was the name of Nelson's flagship at Trafalgar?

39. Rewrite the sentences, writing the complete word:
   i. The letter ended, Yours ....y, Kanta.
   ii. My new a———s is 26, Churchgate Reclamation, Bombay-1.
   iii. There are thousands of books in the school l———y.
   iv. Warm clothing is n———y in very cold weather.
   v. Farmers use machine to s———e the cream from the milk.

40. Rewrite the sentences giving one word instead of those underlined in each of the following:
   i. The man in charge of the ship ordered the crew to abandon the ship.
   ii. The woman in charge of the hospital inspected the wards every morning.
   iii. The man in charge of the boys' school will shortly be retiring.
   iv. We asked the man in charge of the railway station for concession tickets.
   v. The man in charge of the library allowed Sheila to borrow the book for a month.

41. Analyse the following:
   i. Many children have read the story of Ali Baba.
   ii. The man of wealth should help the poor.
   iii. Some cruel drivers twist the tails of their bullocks.
   iv. The kind Rajah gave his servant a bag of gold.
   v. A few soldiers guarded the entrance of the castle.

Note: Here the columns for analysis were given to the children and they merely had to fill in these words in the right columns.

42. Comprehension:
The old gentleman, who was a respectable-looking person had taken up a book from the stall outside the bookshop, and there he stood, reading away as hard as if were in his own study. Oliver was scared, as he stood a few paces off, to see the boy plunge his hand into the old man's pocket and pull out a handkerchief; to see him hand it over to his friend; and finally to behold them both running away found the corner at full speed.
   (i) Where was the old gentleman standing?
   (ii) What was he doing?
   (iii) What did Oliver see the boy take from the old gentleman's pocket?
   (iv) To whom did the boy hand what he had taken?
   (v) What did both boys do then?

43. Make sentences with the similies completed:
(i) as though as (ii) as deaf as a (iii) as poor as a (iv) as heavy as (v) as smooth as

APPENDIX II

Tabular Results of 1st Term and 2nd Term (New-Type tests)

Standard VII A and B

Table I

Subjects	*P. Teachers' Ranks & Pupils' Ranks Col. I				Mean Scores Col. II				Mean Deviation Col. III			
	1 Word		*1 Sentence*		*1 Word*		*1 Sentence*		*1 Word*		*1 Sentence*	
	A	B	A	B	A	B	A	B	A	B	A	B
English General	.55	.71	.68	.79	34.1	40.6	21.6	35.7	3.6	4.6	6.1	5.1
English Text	.64	.88	.82	.86	34.0	38.4	22.5	31.5	5.1	4.6	5.2	5.5
Regional Language Gujarati	.41	.39	.69	.86	34.8	37.3	23.4	28.2	4.0	4.6	6.6	6.0
Hindi	.58	...	...	.48	41.5	...	...	23.4	3.2	...	...	5.4
Mathematics	.43	.68	.42	.85	37.0	34.0	25.7	20.1	4.4	4.4	3.5	5.9
History	.87	.73	.97	1.00	40.6	38.3	29.1	26.8	5.6	4.4	7.7	6.9
Geography	.61	.40	.88	.65	33.5	39.3	27.7	27.4	5.2	4.8	7.7	7.3
General Science	.70	.61	.72	.82	34.8	41.8	26.5	23.4	5.5	3.6	7.2	7.2

Max. Marks 50, Pass Marks 20, i.e. 40 per cent

*P = Coefficient of correlation .5 is considered to be a good coefficient of correlation.

Observations and Conclusions

This table shows: (1) A comparison between the teachers' ranking and the ranks obtained by the pupils in their weekly tests. (2) The mean scores (with their mean deviations) of the marks obtained in the objective one-word and the short-answer tests.

Col. 1: As will be seen from this Column, P is fairly high in most of the subjects. In mathematics there seems to be a great difference between the two divisions in both the objective and short-answer tests.

This should not have been the case as the same teacher taught both divisions. But there may have been other reasons for this difference. In Geography also there seems to be a great difference. Here also the same teacher had taught both divisions. In English General and General Science the difference could be explained by the fact that two different teachers taught the two divisions.

Col. II: The pass percentage is 40, and 20 marks are the passing marks out of 50. It will be seen that the mean scores in the objective one-word tests range from 34 to 41 with mean deviations from 3.2 to 5.6. This is fairly high. In other words the pupils scored fairly high marks in these tests.

In the short-answer type, the mean scores range from 28 to 35 with mean deviations from 3.5 to 7.7. The mean scores in these types of tests are also high, but not as high as in the objective one-word type of test.

In view of the above, it was decided to raise the pass percentage of the objective one-word type of test from 40 to 50 per cent to maintain the 40 per cent for the short-answer tests in the following year.

TABULAR RESULTS OF TERMINAL & FINAL EXAMS. (New-Type Tests)

Standard VII A and B

Table II

Subjects	*P. Teachers' Ranks and Pupils' Ranks Col. I				Mean Scores Col. II				Mean Deviations Col. III			
	1 Word-1 Sentence				*1 Word*		*1 Sentence*		*1 Word*		*1 Sentence*	
	A	B	A	B	A	B	A	B	A	B	A	B
English General & Text	.61	.80	.81	.87	33	31	25.5	29.2	3.6	4.5	5.5	5.4
Regional Language Gujarati	.76	.55	.78	.62	32.8	32.8	31.8	25.7	5.8	4.9	7.1	5.2
Hindi	.66	.59	.69	.82	40.1	42.1	25.7	26.9	2.8	2.9	5.4	5.70
Mathematics	.61	.61	.68	.40	30.4	34.1	29.9	19.7	6.0	7.6	5.9	6.0
History	.20	.70	.76	.72	39.3	29.2	26.9	28.7	4.4	5.2	6.7	7.6
Geography	.67	.31	.57	.64	36.7	27.8	32.3	29.6	4.8	3.8	5.7	5.7
General Science	.61	.37	.78	.53	34.5	38.5	29.4	24.5	3.8	3.1	6.3	4.2

Max. Marks 50, Pass Marks 20, i.e. 40 per cent

Observations and Conclusions

Col. I: As will be seen from the two columns the coefficient of correlation is fairly high in most of the subjects.

Col. II: The mean scores are fairly high in most of the subjects, though there is a great difference again in mathematics between the mean scores of VII B in the objective one-word and one-sentence.

In Hindi again there is a great difference between the one-word objective and the short-answer in both divisions of this standard.

The mean scores of the short-answer one-sentence tests are lower than the mean scores of the objective one-word.

Col. III: The mean deviation in the short-answer type is higher than the mean deviation in the objective one-word tests, in most cases.

TABULAR RESULTS OF TESTS AND EXAMINATIONS

Standards VII A and B

Table III

*P. Coefficient of correlation between (i) one-word objective type (ii) short-answer type, Coefficient obtained from pupils' ranks in 1st and 2nd term tests and terminal and final examinations.

Subjects	Col. I 1st term & 2nd term tests		Col. II Terminal & Final Exams.	
	A	B	A	B
English General	.57	.64	...	...
English Text	.75	.65	.71	.74
Regional Language Gujarati	.39	.35	.81	.58
Hindi	There were no tests in Hindi in the 2nd. Term.		.56	.67
Mathematics	.09	.61	.61	.37
History	.33	.59	.69	.77
Geography	.38	.04	.69	.52
General Science	.44	.42	.53	.33

Observations and Conclusions

This table shows the coefficient of correlation of ranks obtained by the pupils in (i) the first term and second term weekly tests and (ii) the terminal and final examinations of the classes under experiment.

Col. I : Here again it is seen that the correlation is fairly high in most of the subjects except mathematics, history and geography. In mathematics and geography the same teachers taught the subject in both divisions, therefore, the results obtained should not have normally gone haywire, though other factors may have contributed to this. In history the reason may have been that two different teachers taught the two divisions.

Col. II : In VIIA, P is fairly high. In standard VIIB, except for mathematics and general science, P is fairly high. In general science two different teachers taught the two divisions. In mathematics, however, again the same teacher taught two divisions.

Tabular Results of Terminal and Final Examinations (Essay-Type)

Standards VIII A and B

Table IV

Subjects	*P. Teachers 'Ranking and Pupils 'Ranks Col. I				Mean Scores Col. II				Mean Deviations Col. III			
	Term. Ex.		Final Ex.		Term. Ex.		Final Ex.		Term. Ex.		Final Ex.	
	A	B	A	B	A	B	A	B	A	B	A	B
English General	.77	.99	.74	.92	52.7	59.4	47.0	59.4	7.7	10.8	8.6	13.2
English Text	.78	.99	.85	.93	44.8	54.7	48.7	55.2	9.1	17.1	7.9	11.9
Regional Language	.85	.86	.79	.92	41.2	43	42.0	42.3	8.6	7.8	9.8	10.6
Hindi	.85	.79	.90	.77	48.2	52.4	46.4	49.4	12.8	11.2	9.4	10.2
Elementary Mathematics	.47	.75	.21	.72	42.0	49.3	46.4	46.2	11.0	15.8	9.8	16.7
General Science	.50	.50	.23	.77	48.6	48.4	56.6	56.0	8.8	11.7	8.1	10.2

Max. Marks 100, Pass Marks 40 per cent

Observations and Conclusions

This table shows the results of standard VIII A and B, which was the control class in the traditional essay-type of examination.

Col. I: A comparison is made between the teachers' ranking and the ranks as obtained by the pupils in the terminal and final examinations. The coefficient of correlation is fairly high in most subjects except general science and mathematics.

Col. II: The mean scores vary between 41 and 59, but when compared with the mean scores in the objective one-word tests in standard VII A and B they are definitely lower (see *Table II*).

Col. III: The mean deviation vary between 7.7 and 17.1. These are much higher when compared with the mean deviations of the objective and short-answer tests (*Table II*).

TABULAR RESULTS OF 1ST. AND 2ND. TERM WEEKLY TESTS

Standards VII (1958-59) & VIII (1959-60)

Table V

*P. Coefficient of correlation between new-type tests (objective & one-sentence) and essay-type tests

Subjects	Col. I		Col. II	
	First Term		Second Term	
	A	B	A	B
	VII A & VIII B One-Word & Essay	VII B & VIII A One-Sen. & Essay	VII A & VIII B One-Sen. & Essay	VII B & VIII A One-Word & Essay
English General	.38	.77	.31	.58
English Text	.42	.48	.33	.65
Regional Language	.29	.53	.59	.32
Hindi	.49	.53	No Tests	No Tests
Elementary Mathematics	.02	.67	0	.51
History	.27	.56	.08	.39
Geography	0.27	.33	.14	0
General Science	0.65	.45	.44	0

Observations and Conclusions

Cols. I A and B: The coefficient of correlation is higher in the one-sentence than in one-word tests.

Col. I A: On the whole the correlation is low (below 5). In three subjects there is no correlation. This may be due partly to the fact that different teachers taught these classes in the two years. In two subjects it is very low. This may be again due to a change of teachers. In English Text and General and Hindi the same teachers taught the class in the two years.

Col. I B: The coefficient of correlation is fairly good in most cases except in geography. In this subject there was a change of teachers in the two years. In science also there was a change of teachers.
Cols. I and II: From the above it is clear that there is a much better correlation in the first term than in the second term; first term results seem to be fairly steady.

TABULAR RESULTS OF TERMINAL AND FINAL EXAMINATIONS

Standards VII (1958-59) & VIII (1959-60)

Table VI

	*P. Coefficient of correlation between new type tests (objective and one-sentence) and essay-type tests			
	Col. I		Col. II	
	First Term — Terminal		Second Term —Final	
	A	B	A	B
	VII A & VIII B One-Word & Essay	VII B & VIII A One-Sen. & Essay	VII A & VIII B One-Sen. & Essay	VII B & VIII A One-Word & and Essay
English General & Text	.47	.93	.66	.65
Regional Language	.79	.69	.78	.50
Hindi	.55	.72	.59	.55
Elementary Mathematics	.65	.42	.33	.64
History	.53	.77	.48	.31
Geography	.25	.44	.35	.73
General Science	.43	66	.31	.12

Pass Marks 50 per cent

Observations and Conclusions

Cols I A and B : The coefficient of correlation is generally higher in the one-sentence than in the one-word type.

Col. I A : The coefficient of correlation is fairly good as compared with Table V. Col. IA. The discrepancy may be due to the fact that the pupils had to become familiar with the new-type tests. The main reason for higher correlation here seems to be that the weekly pupils usually do better in their final examinations than in the weekly tests. In geography and science the correlation is low. This may be due to the change of teachers.

General Remarks: Comparing both the tables—Tables V and VI—one cannot fail to notice that the one-sentence type of tests have come out best on the whole. The higher correlations in Col 1 B in both the tables are evidently due to the fact that the one-sentence type of tests are very similar to the essay-type tests.

It should be borne in mind that there are many variables in this experiment all of which could be controlled. There is a good deal of time lag in the different tests. The teachers have changed in some cases. The standards compared are different, although the same children were tested in the different standards. Above all, the emotional attitudes of the pupils are quite different in the different tests and examinations : Some of these are weekly tests, some are terminal examinations, and some are annual examinations.

APPENDIX III

Tabular Results 1st Term and 2nd Term Tests

Standards VIII (1960-61)

Table I

Subjects	*P. Teachers' Ranking and Pupils' Ranks		Mean Scores		Mean deviations	
	Col. I		Col. II		Col. III	
	A	B	A	B	A	B
	** 1st Term	*** 2nd Term	** 1st Term	*** 2nd Term	** 1st Term	*** 2nd Term
English General	.85	.91	27.8	29.1	6.03	7.4
English Text	.96	.92	31.9	26.0	8.3	6.1
Regional Language	.83	.98	19.7	25.3	7.4	4.5
Hindi	.54	.83	25.9	21.9	6.35	4.1
Elementary Mathematics	.98	.93	23.4	23.2	6.7	8.4
History	.81	.62	28.7	28.7	7.9	7.6
Geography	.94	.78	32.3	25.7	6.4	4.0
General Science	.99	.82	29.2	23.6	6.7	5.1

*P coefficient of correlation 5 is considered to be good coefficent of correlation.
**1st Term—Objective Short Answer.
***2nd Term—Essay-Type.

Observations and Conclusions

Col. I A and B: (1st Term) Correlation is good on the whole, except in Hindi. (2nd Term) Correlation is good.

Col. II A and B: (1st term). The pass per cent was 40, i.e., 20 marks out of 50. All scores are above the pass marks except in the regional language. The corresponding scores of this class last year, using objective one-word tests, were higher in regional language, mathematics, general science and Hindi. (2nd term) The mean scores range from 21 to 29, while in II A, they range from 19 to 32. This is normal. One-sentence tests are closer to the essay-type than to the one-word.

Col. III: The mean deviation range from 6 to 8 in A and 4 to 8 in B. This is normal as the essay-type has a wider range of marks.

It may be pointed out here that the corresponding mean deviations of the objective one-word tests for the same class the year before were more or less the same.

TABULAR RESULTS OF TERMINAL AND FINAL EXAMINATIONS

Standard VIII (1960-61)

Table II

Subjects	*P. Teachers' Ranking and Pupils' Ranks Col. I		Mean Scores Col. II		Mean Deviations Col. III	
	A ** 1st Term	B *** 2nd Term	A ** 1st Term	B *** 2nd Term	A ** 1st Term	B *** 2nd Term
English General	.86	.90	30.0	27.96	7.7	14.1
English Text	.86	.89	29.0	25.01	7.2	11.9
Regional Language	.61	.85	22.5	24.6	6.1	8.4
Hindi	.49	.60	20.5	22.6	5.1	8.1
Elementary Mathematics	.81	.89	25.8	22.7	5.3	18.2
History	.80	.58	32.8	29.6	8.7	5.1
Geography	.61	.63	23.0	29.1	4.6	5.8
General Science	.67	.67	24.0	27.7	6.8	12.9

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* P coefficient of correlation 5 is considered to be good coefficient of correlation.

** Objective Short-answer.

*** Essay-Type.

Observations and Conclusions

Col I A and B: Correlation is good, except in Hindi in A. In B correlation is good on the whole.

Col II A and B: The mean scores in all cases are above the pass marks (20 out of 50). The corresponding scores of this class the previous year were fairly high, except in mathematics.

Col III A and B: The mean deviation range from 4 to 8 in A and from 5 to 18 in B. In either case they are higher than in the weekly tests given to the class.

It may be pointed out here that the corresponding mean deviations of the objective one-word tests for the same class the previous year did not have such a wide range.

Tabular Results of Coefficients of Correlation between objective (one-word and one-sentence) and Essay-Type Tests (1959-60 & 1960-61)

Table III

Subjects	*P. Coefficient of correlation between new-type tests (one-word and short-answer and Essay-type Tests			
	Col. I Std. VII (1959-60)		Col. II Std. VIII (1960-61)	
	A Tests *	B Examinations **	A Tests *	B Examinations **
English General	...	...	.84	.89
English Text	.64	.74	.83	.88
Regional Language	.67	.70	.63	.60
Hindi	.38	.54	.74	.82
Elementary Mathematics	.58	.70	.71	.85
History	.65	.77	.46	.57
Geography	...	.69	.58	.72
General Science	.40	.67	.68	.73

*One-Word and Essay-Type
**One-Sentence and Essay-Type

Observations and Conclusions

Col. I A: Correlation is fairly good except in Hindi and Mathematics.

Col. I B: Correlation is good in all.

Col. IIA: Except in History, the correlation is good.

Col. II: Correlation is good in all.

It can be seen that correlation is generally higher in Col. II than in Col. I. Thus new-type short answer correlate better with essay-type tests than new-type one-word tests do.

TABULAR RESULTS OF FIRST TERM TESTS AND TERMINAL EXAMINATIONS

Standards VII (1959-60) and VIII (1960-61)

Table IV

Subjects	P. Coefficient of correlation between new-type tests and short-answer tests.	
	(One-word)	(One-sentence)
	Col. I	Col. II
	First Term	Terminal
	Stds. VII and VIII	Stds. VII and VIII
	One-Word and Short-Answer	One-Word and Short-Answer
English	.46	.65
Regional Language	.42	.30
Hindi	.31	.26
Elementary Mathematics	.18	.39
History	.56	.49
Geography	.30	.72
General Science	.33	.46

Observations and Conclusions

Col. I: Correlation is low on the whole, except in history. It is very low in mathematics.

Col. II: Correlation is low in Hindi, mathematics, general science and the regional language, but fairly good in English, geography and history.

TABULAR RESULTS OF TESTS AND EXAMINATIONS IN DIFFERENT SUBJECTS IN DIFFERENT STANDARDS (1960-61)

Table V

	1st Term Tests & Terminal Exams.	2nd. Term Tests & Final Exams.
Std. V:	One-sentence, short-answer	One-word
Std. VIA	Essay-type	One-word
Std. VIB	Essay-type	One-sentence
Std. IXA	One-word	Essay-type
Std. IXB	One-sentence	Essay-type

Standard Division and subject	*P Col. I A **	*P Col. I B ***	Mean Scores Col. II A Tests 1st Term	A Tests 2nd Term	B Exams Term.	B Exams Final	Mean Deviations Col. III A Tests 1st	A Tests 2nd	B Exams Term.	B Exams Final
V History	.61	.06	23.2	32.1	23.0	31.2	7.5	7.85	7.88	6.27
VIA Geography	.21	.61	27.5	36.6	23.1	34.6	8.5	5.7	6.5	4.5
VIB Geography	.71	.80	25.4	26.5	19.6	28.8	8.0	5.1	7.0	6.3
General Science	.69	.60	33.8	22.5	36.5	24.7	5.6	5.9	5.2	13.1
General Science	.59	.65	33.0	24.0	28.3	23.8	5.2	5.1	5.3	12.5

*P coefficient of correlation between new type tests and essay-type tests Col. 1.
**Tests 1st and 2nd terms.
***Exams. Terminal and Final

Observations and Conclusions

Col. IA and B: Std. V—Good correlation for tests; no correlation for exams.

Std. VIA & B—Fairly good correlation, except for tests in Std. VIA

Std. IX A & B:—Fairly good correlation.

Col. IIA and B—Std. V—One-word scores higher than one-sentence. Std. VI A and B—Essay-type scores are lower than short-answer, and the short-answer scores are lower than one-word scores.

Std. IX A and B—Same as for Std. VI A and B.

Col. III A and B Std. V—Mean deviations are more or less steady. Stds. VI A and B—Mean deviations are higher for essay-type. Stds. IX A and B—Mean deviations is highest in essay-type only for final examinations.

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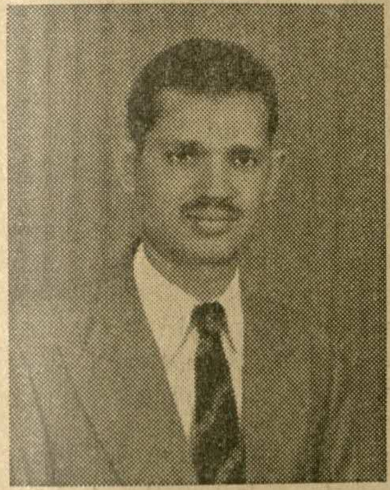

SYSTEM OF EXAMINATION AT SECONDARY STAGE

S. R. CHATURVEDI

Examinations are generally employed to measure achievement, but they can be most valuable instruments in the hands of the teacher and educational administrator to serve several other much more important purposes of education. Thus:

(i) The primary function of education is to help children to develop and grow. The contents of different school subjects and classroom procedures are intended to effect the desirable kinds of growth and modification of behaviour in the students. Naturally, any educational organization and the community at large need to know particularly how far these objectives are being achieved. The evidence collected by examinations may indicate a need for reconsideration of the school practices, and stimulate a study into the causes of their relative ineffectiveness, as well as suggest ways to improve them.

(ii) If the tests are quite frequent, they are a very useful tool in the hands of the teachers. They provide a basis for guidance. The teacher can collect a lot of information about the individual students through these tests, particularly the points of strengths and weaknesses in their learning. The information can be utilized for the purpose of providing remedial instruction and further educational guidance.

(iii) The teacher as well as the students are always anxious to know how far their efforts are bearing fruit in the direction of the objectives which they have set forth. It has been established through several psychological studies that a knowledge of results itself serves as a great impetus to further efforts. Examinations, thus, provide a sort of psychological security to both the teacher and the taught.

(iv) Examinations provide an incentive to work. Students as well as teachers are influenced by the type of test conducted in an institution. If ability to reproduce facts is tested, the students engage in memorization of facts; if the understanding and application of principles are tested, they try and are helped to understand and apply principles learnt. The frequency of tests also matters as far as the qualities of learning and retention are concerned. Studies have shown that students taking weekly tests learn better and retain longer than those taking terminal tests only.

(v) The examinations offer a basis for classification and promotion of students.

When a testing programme forms an integral part of the whole educative process, and is taken up with a clear concept of the educational objectives of the course defined in terms of the modifications sought in pupil behaviour, it serves all the above purposes, and then, it is termed evaluation.

The Present System of Examination

Unfortunately, the present system of examinations at the secondary stage as in vogue in the state of Madhya Pradesh falls far short of this concept of evaluation. Only one purpose, viz., that of deciding the promotion of students and assigning divisions to them has assumed undue importance. As the efficiency of the school or a teacher is judged from the results shown in the examinations, a mad craze for results has started. The teachers teach and the students learn only for the sake of securing good marks at the examination. Even the step taken to improve the system by providing for partial internal assessment could not escape the baneful influence of the unhealthy competitive spirit in getting results. The worthwhile objectives of teaching different school subjects, and of education in general, are completely ignored.

Lack of Validity in Question Papers

The examinations as conducted at present are not even valid tests of achievements in school subjects. All that they appear to measure is information and all that they succeed in testing is rote memory, that too when the answer-books are judged fairly and with a uniform standard in view, which is not always the case. The reasons for this can be traced as follows:

(i) The question papers used in the examinations take a very narrow sampling of what is expected to be learnt during a course. So they cannot be said to measure all the knowledge expected to be gained. Further, it makes the students and their teachers view examinations as a matter of chance.

(ii) The questions set in the paper are of a hackneyed type, many of which are repeated more or less unchanged at approximately predictable intervals. They are written in a hurry without any clear conception of the objectives to be achieved during the course.

They aim only to assess acquisition of information during the coverage of the syllabus laid down by the Board of Secondary Education in the form of topics and sub-topics. A battle of wits starts between the examiner backed by the board on one hand, and the examinees backed by the teachers on the other. The latter plod through question papers of the last few years, make use of the process of elimination and sifting, and try to guess questions to be asked this year. They also run for 'hints' from all possible sources employing all possible means. Teachers dictate them answers to these 'important' questions, and many money-making authors and publishers supply them with the 'Sure successes', 'Guides' or 'Guess papers' which contain ready-made answers to expected questions. The students merely try to commit them to memory, and re-produce them in the examination, if luck favours them. The examiner, on the other hand tries to make his sampling as new as possible within the time at his disposal, and tries to introduce a few tricks and catches. The Board tries to keep the paper 'Confidential'. Questions set in examination papers which are apparently designed to test thinking become in effect tests of memory. For example, questions of the type:—

'Discuss the causes of.....................',
'Illustrate with examples, the.....................',
Or
'Compare and contrast.....................'

do not call for any higher mental processes involved in finding out the cause and effect relationship, selecting particular examples in order to illustrate a general principle, or comparing on the basis of certain known criteria. The reason is that the answers to these question, and question papers, thus, suffer from a lack of validity in as much they do not succeed in testing what they are intended to test.

Lack of Validity in the Valuation of Answers

Besides the lack of validity in question papers, the valuation process is also lamentably invalid. The examiner does not clearly know what actually he is supposed to measure. For example, it is not uncommon for the examiners in languages to award marks for the details of a story without any consideration for correct spellings, usage and expression which are the avowed objectives of language study.

The pattern of the board examinations is followed in the local examinations of the schools. The result is that the regular study habits are being discouraged, and selective study, more or less rote memorization of answers to selected questions, is the order of the day.

Lack of Reliability

The subjectivity involved in the evaluation of essay type answers, greatly reduces the reliability of our examinations. The same answers can receive different credits at the hands of different examiners, or from the same examiner at different times. There used to be a nominal check of the head examiner who was supposed to go through a small sample of valued answers from each of his co-examiners, but, even that practice has now been given up. Naturally, the marks awarded by different examiners are not at all comparable. This makes the result of a candidate a mere matter of chance. This uncertainly is one of the causes of the hunt after the addresses of the 'examiners' and illicit approaches made to them.

Meaninglessness of Marks

Further, the marks obtained by a candidate in a question paper are subject to no logical interpretation. The arbitrarily fixed levels of passing or receiving different divisions in terms of the percentage of marks obtained have no logical basis. Dots a score of 33 per cent mean that the candidate possesses the knowledge of 33 per cent of the course? Does it even mean that he knows the answers to 33 per cent of the questions asked? With the defects of sampling and type of question set, neither of the above two questions can be answered in the affirmative. The percentage score cannot have any meaning unless it is referred to the nature of the distribution of marks in a paper over the whole group of candidates passing in a subject may be more easy in one examination than in another, depending upon the difficult level of the questions set, which is never fixed.

Relation with indiscipline in Schools

The uncertainty of results in examinations held ceremoniously after long intervals of time gives rise to serious tensions and frustrations, which serve as one of the factors responsible for indiscipline amongst the students and unprofessional conduct among the teachers. As the students are aware that the result in the annual examination mainly counts towards their promotion, they tend to neglect their studies till the examination approaches. During these idle months, the energy of the youth is employed in playing all manner of unhappy pranks and doing useless things not conducive to normal behaviour. As the examination draws near, they get more and more tense, start running for help to solved question papers, cheap guides, notes and private tuitions and there is a wild 'hunt for hints'. The economic stringencies of these hard times drive teachers to take up tuitions on contract basis. They sell their soul, and adopt many varieties of fair or foul means to see their 'clients' (for that is in fact the relationship) get through the examinations.

Whether in external or internal examinations, group politics enters the schools, and feelings of distrust prevail amongst the teachers, as also between the teacher and the taught. The whole atmosphere of the schools is vitiated. This completes the picture of the evil effects on examination system.

Introduction of Internal Assessment

Recently a very promising and commendable step has been taken by the Board of Secondary Education, Madhya Pradesh, by introducing a system of internal assessment according to which schools are required to contribute 100 per cent marks in social studies, general science and crafts, and 20 per cent marks in other subjects to the final result to be declared by the Board. How unfortunate it is that all the principals and teachers are not utilizing this opportunity for making the examination more rational and useful. A spirit of unhealthy combination between schools seems to threaten the very scheme of internal assessment. Two suggestions can be offered to the Board to meet this situation. They are:

1. Internal assessment should be entered separately on the mark sheets of the candidates.
2. The Board should arrange for inspection of the school records from time to time to make sure that there are adequate bases for internal assessment made.

A Project on Improvement in Examination and Teaching Practice

Practical implications of the general principles of the evaluation approach were brought to light when it was tried out in two higher secondary schools of Gwalior and Bhopal. It was early in August 1959, that a staff meeting of Gorkhi Higher Secondary School, Gwalior, considered the impact of the prevalent examination system on the academic and general life of their school. They also considered the new scheme of internal assessment introduced by the Board of Secondary Education, Madhya Pradesh. It was keenly felt that something should be done to improve the existing state of affairs. A sub-committee of enthusiastic teachers was formed to plan a project aiming at improvement in the evaluation system as well as in classroom practices. The draft of the scheme was discussed, modified and approved by a general meeting of the staff. It was then presented to the executive committee of the 'Parents and Teachers' Association, and was commended by them. The project was then submitted for the approval of the Deputy Director of Education, Gwalior. He discussed it with the principal, and was kind enough to permit him to try it on an experimental basis. And thus the project was launched in September 1959.

The new scheme required preplanning of each teaching unit with special emphasis on clearly defining the specific objectives of teaching that unit. After teaching each unit, a short answer type test was to be given keeping the objectives of teaching in view.

These tests were to be used for the diagnosis of pupil difficulties and taking remedial steps, and the result of these tests was to contribute to the final annual result. A study circle of the staff was organized, which met on every Saturday to discuss the problems confronting them.

Towards the end of the school year, a committee of three senior members of the staff was appointed to evaluate and report on the working of the experiment. The committee expressed general satisfaction at the working of the scheme. They, however, pointed out certain difficulties that were faced, viz., (i) The transfer of teachers in the middle of the academic session presented obstacles to the smooth working of the scheme of continuous evaluation; (ii) The admission of new students in mid-session called for special treatment in their cases; (iii) The students absenting from tests created problems for teachers in maintaining uniformity in the records; (iv) School funds could not provide for duplication of unit tests, and so difficulties were experienced while administering the tests, and their quality and frequency also suffered; (v) Maintenance of record and communication of reports to the parents was found to be time-consuming and imposed an extra burden on the teachers which was generally unwelcome. Minor alterations in the original scheme and in the method of maintaining records were also suggested.

The evaluation committee and the rest of the staff were unanimous in acknowledging the advantages of the scheme. They felt that the project had developed in teachers the habit of planning their teaching in clear relation to objective. It had made students more regular in their studies and attendance. They also expressed the feeling that the teacher-pupil relationship and the general tone of the school had shown marked improvement, and the guardians seemed to take more interest in the day-to-day progress of their wards. Encouraged by the success of the experiment at Gwalior, another such project was undertaken at the Government Boys Higher Secondary School, T.T. Nagar Bhopal, in 1960-61 and 1961-62. This project was planned and developed on much the same lines as at Gwalior, and drew heavily on the experiences gained there. The project was approved by the Directorate of Extension Programmes for Secondary Education, New Delhi, and was financed by them.

Aims and Objectives

The aims of the project were mainly:

(a) to lesson fear and tension on the eve of examinations,
(b) to promote regular study and discourage guess-work,
(c) to improve teacher-pupil relationship,
(d) to improve school discipline by keeping students well engaged throughout the year, and
(e) to make evaluation a tool of teaching and guidance.

Procedure

The teacher planned units of teaching, keeping certain specific objectives in view. A short answer type test was given at the completion of each unit. Besides, home assignments practical work or other co-curricular activities were assessed regularly. The tests and assignments were used for the diagnosis of pupil difficulties and some remedial measures were taken. A more rational marking on a standard nine-point scale was introduced. A part of the question papers of terminal and annual examinations consisted of short answer type questions and covered a major portion of the course. While compiling final results, 25 per cent weight was given to the tests and assignments, 25 per cent to the terminal examination and 50 per cent to the annual examination. Frequent conferences of teachers discussed common problems.

Evaluation

The project was evaluated from time to time by the principal, the staff and the students. The results were quite satisfactory. The annual results were declared in an atmosphere of mutual trust and goodwill. No complaint was received against the evaluation of answer books in contrast to what usually happened in previous years. The answer books were open to inspection by students and guardians, if they so wished. On account of the strict fairness observed in internal assessment, the school results in the Board Examinations were quite satisfactory.

Conclusion

The above experience of three years in two different schools provides a good basis for recommending drastic changes in the present examination system by the introduction of a system of continuous evaluation. The Directorate of Extension Programmes for Secondary Education has been laying great emphasis on action research for the improvement of school practices. If experimental work is undertaken in this area more and more teachers will be convinced of the need and there is no doubt that the whole system of examinations and consequently the quality of instruction in schools will change for the better. Only then, we can hope to achieve the broader aims of education.

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ASSIGNMENT SYSTEM

J. S. CHOKSI

We are a union—a group of mofussil schools, having a common system of textbooks courses of study, examinations and cultural activities. We united together to fight against the poor educational standards and the paucity of educational aids, that we generally experience in the new mofussil schools. In our effort to face these evils, we had to shape and reshape our plans and proceedings according to the changing situations that arose from time to time. These changes were due to the changes in staff, in the methods of teaching, in the courses of study prescribed by the Department. In spite of our honest efforts the teachers complained that the achievements and performances of the students were not up to the mark, and that the time and energy devoted to the class teaching were not proportionately rewarded. On the other side the guardians of the pupils confessed that their wards were working till late hours but the examination results were not encouraging. Thus the crux of the whole confusion lay in the lack of a proper and regular study-habits, among the children. The reading of the boys was to be made more purposeful, more objective. This led us to construct a number of assignments in a few subjects. These assignments were primarily meant to focus the attention of the pupils on various aspects of a topic. We tried to supplement our teaching technique through such assignments in a carefully graded way. Gradually we worked upon such a system and are now able to say that we have a kind of satisfaction of our honest efforts. We are ever vigilant to reconstruct our experience of these assignments in the light of our needs.

Underlying Educational Philosophy

The underlying educational philosophy of the system is to make the students of all the levels to read the topic with a proper mind-set, to show them the continuity and unity of the sub-topics and topics, to sense the objectives—instructional objectives, to lead them to self-activity and to lessen the burden and the boredom of the class-teaching of the teacher.

MIND-SET

The system gives an unrestricted opportunity to develop a mind-set. The questions on a sub-topic make the students alert to read with a purpose. His fluttering and fluctuating attention comes to concentrate to solve or to answer a questionnaire series of questions. This mind-set is a factor in motivation. The pupil in a mofussil area has his own duties to attend. He has to tend the cows and buffaloes. He has to stand near a cow when it is being milked. He has to help his father in loading and unloading of the fodder. Will our pithy and pointed questions not set him thinking on a school subject? Yes, it really serves this purpose, as the assignment is a cyclostyled sheet with him, nay it is the teacher, who has tried to guide the pupil for his learning to be followed. Thus this mental-set denotes a state of eagerness to know and to do and bring a release of energy. In a broader sense this mind-set is a mental attitude. Building up this attitude is the best possible use of teaching time because the mental-set determines the amount of application made during the learning time. After all it is the learning of the subjects and its sub-topics that shows the effectiveness of instruction.

GUIDING STUDY

The assignments guide the students to proceed efficiently on their own powers and to draw out their inner most selves. They provide not only for the gifted and average, but also encourage the backward child. A graded system of assignments is a friend and philosopher to the gifted, an invigorator to the average and solace and comfort to the backward group of pupils. It directs self-activity of the pupils into the most profitable ways of studying. The pupils asking the grand old men of the village about the bonafides of an inscription on the local temple or that on a local well gives a pleasant glitter in the eyes of the guardians. It relieves the pupils from mental states of boredom, fear of failure and worry.

UNITY

The system of assignments brings about the unity among the diversity of the topics and the sub-topics of the same subject. The pupils get a clear notion and vision of the work completed and the work remaining to be completed. This vision gives direction to daily study and leads to the understanding of a significant development in the field of learning.

The accompanying assignments on 'The Rise and Fall of Roman Empire' illustrates how the unity is maintained among the various topics of the social studies of class VIII. Thus the assignments organize and unify the learning from day-to-day. The pupils visualize the inherent relationships that slowly unfolds in the forms of skill, concept, attitude or ideal.

SENSING THE OBJECTIVES

The system of assignments emphasizes the instructional objectives before the teachers as well as the students. Thus it arms the teacher with such a weapon that he is ever vigilant about the purposes of his teaching. He will be knowing what he has to teach to his pupils and why he has to teach the topic to his pupils. In his turn he makes the pupils conscious what they have to learn and why they have to learn that topic.

The pupils studying Europe should know that they are expected to know the exact location of important cities and rivers and that the influence of natural and physical geography on the later development of the cities.

LESSEN THE BOREDOM

In our zeal to make the present education a child-centered enterprise, we sometime overlook the case of the teachers. The heavy work load, the rush of pupils from all the sections of the society, the lack of in-service training and the complexities of day to day personal life have made the teachers fumbled and puzzled. He has no breathing time for any creative work. The assignments give them the vast scope and a considerable amount of time to himself in the class and outside the class. He can make the students work and gets the opportunity of having a personal contact in the class, by going through their work or supervising the busy class. The activities change from pupil to pupil or from a group to group. Will he not get the pleasant satisfaction of getting the class busy and his purpose of teaching being served?

Purposes it Serves

The assignment system serves some immediate and mediate purposes. To an average teacher the assignment is an essential part of his teaching A well-prepared lesson-planning is itself a good assignment and serves the following purposes:

(i) It enables the teacher to know the interests of his pupils in a particular subject area. He is also enabled to discover the specific abilities of the individual pupil which may be developed, while being used for their own good. Even in a social studies class the pupils may ask questions on science.

(ii) The assignment system helps both the teacher and the pupils to set the objectives to meet the needs of the interested area.

(iii) The teacher thinks of the difficulties, which the students have to face in fulfilling the learning of a topic. He guides the pupils by intelligently putting thought provoking questions in his assignments. These questions and guidance to read or to study a topic, call for the pupils' attention to the danger spots and prepare them to face the situation boldly.

(iv) It gives ample opportunity to select certain activities, which will achieve the objectives formerly set before the pupils.

(v) The assignment stimulates eagerness among the pupils to perform such activities. The pictures and models of the ancient people do lead the boys to copy out the same pattern or evolve a new pattern from them.

(vi) The system indirectly helps the pupils as well as the teacher to make a purposeful plan of his learning or teaching activities. The pupil may originate new exercises and choose some of them which he considers worthwhile.

(vii) Finally it enboldens the pupils of different levels gifted, average and slow to launch the attack either individually or in groups by working on the exercises. To facilitate this attack of the pupils, the teacher makes himself available for answering the questions raised by the pupils.

Planning

The following criteria should be maintained to organize the system of assignments:

DEFINITENESS: A good assignment should be definite, clear and interesting. There should be no vagueness.

STIMULATION: It should appeal to the pupils' curiosity, to the desire to achieve or to his well-established interest.

INSPIRATION: It should inspire the students. Enthusiasm of the teacher is an important factor in presenting an assignment. The enthusiasm will be more likely to spread to the group if the suggested exercises themselves invite enthusiastic response.

EXPOSITION: Instructions should make clear to the pupils what is to be done. Difficulties in the topic should be indicated and means of overcoming them should be suggested.

PREPARATION: It should prepare the pupil for new attack or new features of the learning experiences. It should tie up with his past experiences.

DIRECTION: The details of the oral or written assignment is a set of directions to the pupil, which guide his progress in the learning experience. This direction is the most essential feature of either type of procedure.

DISCRIMINATION: Directions for activities should encourage the pupil to select the activities of the greatest interest and value to him. We should suggest such activities to the students which will have relatively high potential values.

VIVIDNESS: The exercises should call for such activities that will give vivid and lasting impressions. Illustrations should be presented either orally or in written form to emphasize outstanding facts.

DETAILS: Minute details of the new learning process are essential for a correct start by the pupils. The written exercises should be supplemented orally to answer all questions the pupils ask.

ARBITRARINESS: We should not arbitrarily impose tasks upon the pupils. We must try to secure their reaction and to encourage their cooperation. Self-selected tasks, performed with zeal result in better retention and greater development.

UNITY: The assignment should be a well-rounded and unified approach. It should lead the pupils to a meaningful and complete learning experience.

FLEXIBILITY: There should be no rigidity in the assignment. The needs of the pupils vary with their interest and abilities. Hence the assignment should be flexible enough to meet the ranges of interests and abilities represented in the group.

EFFECTIVENESS: Any system or procedure which does not achieve our desired aim should be left. Practical use of our procedures or systems will show us the effectiveness from the evaluation of the performances of our pupils. Some procedures which will prove worthy of practice should be made permanent parts of our classroom practice.

Types of Assignments

The assignment system may be classified in four broad types. They are preparatory assignments, study assignments, revisional assignments and remedial assignments.

PREPARATORY ASSIGNMENT

These assignments are meant for orientation purposes. The pupils are to be made conversant with the broad features of the topic. They are made conscious about the interrelation between the topics. Thus the pupils are prepared for the work which is to follow on the next day. This lessens the preliminary pilot work of the teacher in the class. He is now in a position to lead his class with ease and understanding.

STUDY ASSIGNMENT

When the pupils are conversant with the broad features of the topic, they are encouraged to study the details of it. They are guided to follow the activities in which they are interested much. The students may be asked to work in groups and to make a report of their work. Group technique works wonders as there will be healthy competition. The slow and the average become a good fold of followers and help for the success of the group. Each according to his need and each according to his capacity become their watch-word. The out-come is generally hopeful because a friend is teaching a friend. The role of the teacher is to answer the questions raised by the group. This type of assignment generally caters to all the levels of the pupils.

REVISONAL ASSIGNMENT

This type of assignment is worked out to drill and to evaluate the procedure. These assignments are intended (i) for drilling the work done by the students, (ii) for checking their retention and reproduction of the facts, incidents, etc., of the topic, and (iii) for checking the understanding of the topic. These assignments should be worked in advance, keeping in view the objectives—instructional objectives. These may be in a form of tests.

REMEDIAL ASSIGNMENTS

This type of assignments is to be devised in the light of the pupils' reaction to the foregoing types of (i) preparatory assignments, (ii) study assignments, and (iii) revisional assignments. Remedrill and to evaluate the procedure. These assignments are intended (i) for points, misunderstood matters and common mistakes.

Procedure

(1) The syllabus should be divided into suitable units. The teacher should decide which topic needs supplementing to make the whole process of teaching and learning more effective. He should then chalk out a tentative plan for a preparatory assignment and a study assignment.

(2) The teacher should give clear instructions regarding aids, books, pictures and pages, for the successful carrying out of the assignments.

(3) The pupils should be warmed up before giving the assignments. The teacher should try to create an atmosphere so that the pupils may not feel that something is thrust upon them. The teacher should seek their cooperation. A sense of confidence in the teacher will bring active participation.

(4) The teacher should be in a role of an encouraging elder. He should be ready to lend his helping hand to those pupils who are trying to overcome the danger spots.

(5) The report of the group of the work done should be given before the class. The record of this report, after careful editing should be mimeographed and be circulated among the pupils of the same class.

(6) The teacher should be careful to fill-up the gaps of information, if there be any between one assignment and the other.

(7) At the end of the topic the teacher should give a revisional assignment, keeping in mind the instructional objectives.

(8) An individual record card should be maintained (Appendix A).

(9) The teacher, after careful survey of the work of the pupils should work out a remedial assignment, if he thinks it fit. This remedial work should be done by the weak and the slow pupils under the guidance of the brighter pupils.

Evaluation

Evaluation will be made by the following observations:

(i) Has the assignment system encouraged the pupils to pursue further the related activities of their interest, viz., making the charts, the pictures and the drawings, making the collection of some items of their interest, preparing the sketches, dramatization?

(ii) Has the assignment system given a good guidance to make the process of learning fluent and speedy?

(iii) Has it really helped the gifted as well as slow pupils to pursue the learning activities?

(iv- Has the assignment system helped the pupils to plan their further activities independently?

(v) Has it given ease and breathing period to the teacher and enabled him to put more and more planned work in his day to day teaching?

Evaluation of the realization of instructional objectives should be made by means of the traditional and new type tests.

The Role of the Head of the School

1. The head of the school should encourage such new approaches proposed by the teacher, by giving him some facilities of:

(i) books, aids and stationery,

(ii) suitable time-table adjustment, and

(iii) sending the teacher in charge to attend seminars, workshops on his subject.

2. He should count twice for the financial implications of the system and should be clear about it, so that the approach should not be left half-done.

3. He should always try to encourage the teachers and the pupils by mentioning some good points of approach. He should always consult the teacher about the progress of the approach.

4. He should try to familiarize the staff with the new approach and should seek the cooperation of the staff members in making the new approach a great success.

5. He should let the management know about the organizational and financial implications of the new approach. The management may be kept informed of the progress and achievements of the new approach.

6. A review of the progress of the new approach should be submitted and discussed with Educational Inspector at the time of annual inspection in the presence of the teacher concerned.

7. He should consult the Extension Department of his area to help in guiding the new approach from time to time.

The Role of the Teacher

1. The teacher is the chief engineer of this new approach. He should clearly visualize the difficulties of the process of teaching and learning a topic.

2. He should know the encouraging points in the process to which he can make the basic flanks.

3. He should be an open-minded person ready to accept any soothing suggestion from his fellow-teachers.

4. He should create confidence among his pupils by his broad-based reading, thinking and planning.

5. He should seek the cooperation of his fellow teachers for drawing, printing and editing his assignments.

6. He should be familiar with similar approaches carried on elsewhere and to adjust his own in the light of its results.

Financial Implications

While organizing such approaches the financial implications should be considered first. The assignment may be orally given but the written assignments are needed in a greater number. They should either be mimeographed or printed.

1. A mimeographed, handwritten assignment of eight pages will cost nearly Rs. 0.20 p.

2. The expense on the assignment may be debited to Term-fees account under the head of 'Examinations'.

3. A part of the expense may be recovered from the pupils and should be credited to the Term-fees account under the head of 'Examinations'.

4. The management may be requested to allot a small amount to meet the expenses of getting the assignments printed.

Some Difficulties in the Way

1. The management sees such new approaches with skeptical eyes. We have to qualify for asking money on such new approaches by our sincerity of purpose. In our case we had to collect the funds from the surrounding villages and started to grant money. The guardians also paid for this.

2. The change in the staff in the middle of the year vitiates the plan of such new approach.

3. The complaints of copying the answers of the questions of the preparatory assignment will be there. The feeling of copying should be sublimated in a form of mutual discussion. Similarly copying in the new type test may be warded off by applying a time limit to *revisions*.

4. In the beginning the progress will seem to be very slow. The teachers will be experiencing a nerve-breaking work load, and would need patience, planning and perseverence to save this catastrophe. It is advisable not to take up too much of it in the same year. It should spread over a period of two to three years.

5. Lack of coordination among the subject teachers, undertaking this system makes development stunted resulting in frustration among the pupils, mistrust of the teachers and lack of faith in this approach. To be on the safe side the beginning should be made with one class if possible. The system should be applied to other classes in the following year.

6. The headmaster may connive at such new approaches as he has to be uptodate and vigilant about the new approaches. The headmasters' association should take the lead and make a pool of such experimental projects. The association should also work out the details of these projects.

7. The Department always encourages such projects but it never gives help in cash. The engineers of such porjects should convince the Education Inspertorate of its efficacy and I am sure the Department lends a helping hand by admitting some extra expense on the staff or on the stationery. Still I think that some considerations should be made for such experimental work as far as the financial help is concerned.

Reference Books

1. *Modern Philosophies of Education* By J. S. Brubacher.
2. *The Improvement of the Assignment* By G. A. Yoakam.
3. *Secondary School Teaching* .. ..By J. G. Umstattd.
4. *The Improvement of Teaching in Secondary Schools*

By F. A. Butler.

18

SYSTEM OF EXAMINATION AT THE SECONDARY STAGE. DOES IT NEED A CHANGE ?

PREM NATH SAHAI

THIS PAPER deals with the examination system in vogue in Punjab for higher secondary and high classes. There is a total 1850 and 850 (for five papers—marks respectively and 375 and 190 marks are reserved for the internal assessment in the total. The University checks up the average for every subject of every school and reduces or increases the internal awards if they differ by more than 10 per cent of the external awards in that subject, to check subjectivity and malpractices.

During the course of personal interviews with some of the teachers of high and higher secondary schools, the following observations about the position of internal assessment were made:

1. In urban areas, teachers and heads of some of these schools try to be:
   - Extra lenient with a few top students to compete for positions or scholarships.
   - A little stiff or fair with their weak and average students.
   - Hard with those who are likely to spoil their results by failing them in the ninth grade.

2. In rural areas, teachers and heads of some of the schools try to be:
    - —A little stiff with their top and good students who are expected to get more than 55 per cent marks.
    - —Extra lenient with such marginal students who may be expected to get marks between 25 and 35 per cent.
    - —Hard on those who are likely to spoil their results by failing them in the ninth grade.

On further discussion, it was revealed that the schools belonging to urban category usually have 300 to 800 students appearing for one examination and if they are fair to 90 or 95 per cent students, boost the marks of only 5 or 10 per cent students, even by 25 per cent that will not affect the whole average of the school by more than 2.5 per cent which is not objectionable as the University allows a maximum of 10 per cent.

For example the following scores will be the result in urban areas:

For 10 students Internal percentage		*Total including University results*	
Original	Improved	Original	Improved
75	100	1387	1481
60	60	1110	1110
60	60	1110	1110
60	60	1110	1110
55	55	1018	1018
50	50	925	925
50	50	925	925
45	45	838	838
40	40	740	740
35	35	648	648
Average 53 per cent	55.5 per cent	Difference of only 2.5 per cent	

Whereas in rural areas who have the reverse preposition, are likely to have the position of rather weaker group on the average, but top 40 per cent students are comparable to the urban area students, as under:

75	60	1387	1336
60	55	1110	1092
60	55	1110	1092
60	55	1110	1092
55	50	1018	1000
50	50	925	925
50	50	925	925
35	45	648	685
30	45	555	613*
25	45	364	533*
Average 50 per cent	51 per cent	Difference only 1 per cent	

* Should have failed.

The marked difference about the first two students one from urban and the other from rural areas is quite evident. There is a difference of 145 marks in the total of the two. With equal standards otherwise, the student from the rural area will suffer very adversely in scholarships, merit and chances of admission, to institutions of higher learning. Two juniormost students of rural area will be helped to pass through and improve the result of the school.

In view of the above verbal, informed and assumed state of affairs, the results of two rural schools—high and higher secondary, were studied. The following observations were made:

1. In one school 'X' record of internal assessment was not maintained properly and it was extremely difficult to figure out the internal assessment sent to the University. In the other school 'Y', record was well maintained.

2. In school 'X', partial scores of only 10 students out of 150 who appeared in 1962 could be tabulated in three hours sitting and completed for four students by personal contact. In school 'Y', complete record of nine available students out of 100 could be checked.

3. After statistical tabulation of these results, by grouping subjects like English, economics, social studies, Hindi, Punjabi, and geography in one group 'A', subjects like mathematics, general science, chemistry, physics in group 'B' and third 'C' taking the totals as they were, the following results were obtained:

i. Correlations: (Between internal and external awards)

	School 'x'	School 'y'
Group A	1.73	.02
Group B	.59	—.36
Group C (Totals)	.65	—.50

ii. Variations in individual marks by percentage in different subjects:

Group A	—24 to 14	—28 to 40
Group B	—16 to 42	—25 to 28
Group C	—4.4 to 22.0	— 9.0 to 24.0

Note : Plus means that the internal assessment was more than the external and minus means that it was less than the external.

iii. Difference in average marks of internal and external by percentage:

Group A	Zero	.4
Group B	8.0	2.4
Group C	12.6	2.4

Above statistical results speak for themselves that the opinion gathered by interviews is likely to be substantiated if similar investigations are made.

The second aspect of these examinations is the introduction of objective type tests and now their abolition, probably after some investigations or on the general opinion of educators. In no circumstances, it is due to the fact that the objective type tests are not useful or have no utility but it is only because they have not been handled properly by the paper-setters and the supervisory staff at the time of conduct of the examination. Personal experience as an observer and as Superintendent of these examinations has convinced the writer in this opinion. Construction of such tests and their administration are technical jobs requiring special training. Every person, qualified according to the present regulations of the University, not necessarily a fit person for this job.

The third aspect of the present examination system is its mass scale conduct and centralization. The writer is not biased against it but is certainly of the opinion that some decentralization by creating zones or circles according to school population can improve the whole system.

Not the least important aspect of the present examinations is the creation of unhealthy effects and habits in the minds of the students, teachers and parents. These create suspicions, prejudices desire short cuts to pass the examination, guess subjectivity, etc. One of the main causes for this work and charges of is the introduction of too many subjects and papers for examination in the tenth grade and again in the eleventh grade. When the teachers and the taught, both, find and feel the burden as too much, they are bound to search for easy and short cuts. The examination system has a direct link with the subject matter to be examined. Thus the subject matter–number and contents of each, also need reconsideration and reference in this context of examinations.

In view of the above, the writer is of the firm belief that the present examination system needs to be changed after serious and considered thought.

The reorganization of the whole system by introducing the following changes is suggested.

1. Present subjects and syllabi be reconstituted to enable us teaching as detailed below:

- In the 9th grade

Hindi|Punjabi as the first language	Two papers
Core Mathematics	One paper
Social Study	One paper
General Science	One paper and practical
Craft	Practical only

– In the 10th grade

Hindi|Punjabi as second language	One paper
Social Study	One paper
General Science	One paper and practical
English	One paper
One Elective group subject	One paper

—In the 11th grade
English One paper
Elective subject started in the
10th grade One paper
Two new Elective group subjects—four papers and their
practicals if any.

The University examination should be held at the end of every academic year. It may be further more beneficial if in the 11th grade there are two half yearly examinations and the subjects or papers suggested for the same be further split into halves, which is not difficult. Of course in the present centralized system it may be difficult but as suggested further for decentralization, this will not have any difficulty.

2. Internal and external assessment should be modified to give 50 per cent weightage to each. Work during the year for internal assessment should be checked purely by objective tests as provided in the next suggestion. Final examination must be conducted only by essay type tests. Mixture of the two types will help in better evaluation of the students. School may also have periodical essay type tests to acquaint the students of the same and also of their utility, but in no case essay type internal tests may affect the internal assessment. Pass in internal and external separately are compulsory.

3. Zonal or circle offices of the University be set up, preferably in cooperation with the training colleges as their extension departments, who may conduct the periodical test for internal assessment on the work during the year. Each such centre with adequate staff may control about 100 schools or 1500 students in the three grades. The number of schools may vary according to their enrolment in these three grades. A trained representative of the centre may visit every higher secondary school atleast for two days (more for bigger schools) in a month. In these days, he may administer objective type tests in all the subjects to all the classes for their work during the past one month. These tests may also be got scored and raw scores tabulated with the help of the teachers in the school under his direct guidance and supervision. For this work teachers can be educated in a three-day seminar. When standard norms are available, percentile ranks can also be got tabulated there. A copy of these lists be kept by the school for informing the parents and their own guidance. The other copy be compiled by the circle office.

After administration, scoring and tabulation of the tests' results, a copy of the test and answer sheets can be left for two days with the schools concerned for discussion by the teachers of the class so that the students may check up their work, know their weak points, and also revise the whole topic for the month. Teachers may also know the individual and group weaknesses.

If the system is adopted then nine such internal tests should form the basis of the internal assessment for theory part only. No internal assessment be kept for the practical work but the internal examiner can be appointed. In the 11th grade, four such tests may form the basis for half yearly examination.

Such an arrangement can help in automatic supervision of the teachers work, regularity in work, removal of ill feelings, and biases of the students and their parents towards the teachers, and also introduce more objectivity in evaluation, regular work in students, thorough knowledge and understanding of different subjects. It will also improve the school and community relations and understanding.

For every subject and its topics, four equivalent forms of objective tests should be available with the circle office. Any one form may be used in every school at the discretion of the circle office. For better check, schedule can be fixed in secrecy.

4. Objective type tests should be constructed only by trained personnel for this purpose. Training for this purpose can either form a part of the B.T.|B. Ed. training giving it an importance equal to two major papers or a special course of four months after B.T.|B. Ed. should be required. More preferrably a degree of M.Ed.|M.A. Psychology with a special paper on this subject should be the minimum requirement for this. Such people should construct four equivalent forms of the proposed monthly tests and remain in touch with the centre for its results, further improvement and standardization. One such paper-setter be given the work of only one month's assignment for one subject and asked to work on it for three years. After three years work on the test, his work may be checked statistically for its reliability, validity, etc., and if found suitable, accepted for further use in that zone or in other zones. Remuneration may be so fixed as may be rewarding for the work and also alluring enough.

If the above suggestions cannot be accepted then the following changes in the present set up may be adopted to improve the work:

1. The university may check up every individual case and apply the formula of cut or rise with an admissible margin of 5 per cent only. Continued fluctuations of any teacher outside the limit for three years may make him liable for some punishment.

2. The university may apply the formula of correlation to at least 25 per cent of the students of every school by random sampling and accept .90 as reasonable variation.

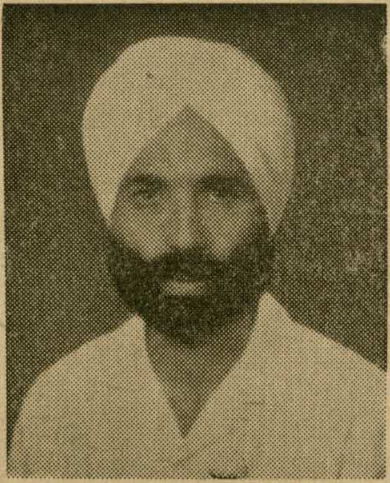
3. The university may check up the cases of top 10 per cent students

of the whole state according to external assessment and apply the individual check in their cases only.

4. The path of least resistance can be to show the internal and exetrnal assessments on the result sheets and award scholarships on the basis of external results only. In that case purpose of internal assessment is likely to be defeated.

5. Pass in external and internal tests separately may be the requirement.

6. In case of students migrating from high schools to higher secondary schools and *vice versa*, their internal assessments should begin with the terminal tests ccurring at least after three months of their joining the course. Similarly for students changing the subjects it should be after a minimum of three months of their change. Any test earlier than three months should not be included in the internal assessment.



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STANDARD OF EDUCATION IN SECONDARY SCHOOLS

T. S. HUNDAL

SECONDARY EDUCATION has been called the weakest link in the chain of our educational system and from time to time various committees and commissions have spared no efforts to enumerate its defects. Problems of quality and quantity crop up in any field, whether economic or social. In India, the resources are so limited that on the one hand the percentage of students of 14-17 age group attending secondary schools was hardly 11.5 in 1960-61 and, on the other hand, the quantity aspect of secondary education has rightly caught the eye of administrators, educationists, parents and teachers.

In pre-Independence era, the Government spent little on secondary education and the denominational bodies under the forces of time could only emphasize the spreading of secondary education. Naturally exceptions apart, none was particular about its educational standards. Today we cannot live in a state of complacency. The problem of educational standards is very conspicuous at the secondary stage, since it forms the terminus of the educational careers of the majority and it lays the foundation of University education which is the spearhead of all pioneering movements in society. Some old die-hards may hold that there is nothing wrong with the secondary education standards, yet the swelling numbers of mass-scale failures and those who are labelled as third divisioners, or those who do not fare well later at college or in other stations of life clearly indicate the sad state of affairs in secondary schools.

According to the wider concept of secondary education, its standards must take into account, the intellectual, moral, social and physical developments of students. If the standards are to be maintained or assessed over so wide a field, the picture becomes much more gloomier. The adverse effects of some of the factors affecting secondary education are to be noted over other stages of education as well but they become particularly prominent in the secondary stage because it covers the adolescent period of life when some problems of the young take a sharper and more bitter turn.

These are the times of mass education and the number of secondary schools has increased from 7288 in 1950-51 to 16,600 in 1960-61. This along with the increase in other facilities for secondary education, has made it possible for students coming from un-educative social environments to receive secondary education. This is no doubt a happy sign but its immediate effect on standards of education has been adverse. Again, the increase in the number of students in age group 14-17 from 12.2 lakh in 1950-51 to 29.1 in 1961-62, has raised pupil teacher ratio so much that individual attention, personal contact, personality effect and intensive class work have simply become impossible. So, for the improvement of standards in secondary education, vital home-school relation needs to be enlivened. Perhaps, residential schools need to be set up for needy students hailing from bad and broken homes and backward areas. Also, the pupil teacher ratio would require to be brought down.

The teacher is an active agent in the matter of educational standards. It is quite evident that after Independence, in the developing economy, persons of even medium ability have the opportunities to plump for better paid positions while the demand for teachers has increased manifold. Thus it is largely the residue that comes to the educational field. Even then demand exceeds supply. In higher secondary schools, there is a great dearth of teachers of commerce, agriculture, technical trades and fine arts. For elective mathematics and sciences either the teachers are not available or they are not fully qualified. Teachers of general science and social studies are not competent to handle the integrated courses. Ordinary graduates, the poor product of universities, teach English. Teachers of Indian languages are rarely qualified in any subject besides their own. No wonder if standards of secondary education are discouraging. When jobs run after teachers and not teachers after jobs, what enthusiasm can be expected from teachers? Not only have academic standards of teachers also gone down but also the quality of their training. It does not cover even a fraction of subjects in higher secondary or multi-purpose schools. The new Kurukshetra experiment of teachers training has yet to prove its worth. The in-service training provided by extension services centres to secondary school teachers cannot probably break the inevitable stalemate of routine with a small staff to cover about 100 to 200 schools.

There are problems regarding quantity too. In 1960-61, only 68 per cent of secondary school teachers were trained. So training facilities should be further expanded and, if need be, through cultural exchanges programmes, foreign experts be imported to arrange for intensive and extensive training, and research.

Action research, in experimental secondary schools working under free conditions, having their own evaluating agency is a dire necessity for evolving new teaching techniques. Pressurized research cannot infuse creative spirit and transplanted research cannot bear much of fruit.

Secondary school teachers should be energetic, impressive, brilliant, having sterling qualities, enjoying a good material and social status. Else, how can he inspire and lead the full fledged adolescents brimming with energy? Exceptions apart, actually we find him without any spirit or faith in the profession. Willy nilly something will have to be done for him. At present the lot of a secondary school teacher is hopeless and it adversely affects his efficiency, outlook of life and educational standards.

Educational standards are also linked with the quality of textbooks especially when the pattern of secondary education is changing rapidly. The textbook market has expanded. Giant firms are engaged in cut-throat competition. Third degree means of power politics are adopted for getting the books approved. Quality authors are afraid of muddy affairs. And attempts at nationalization of textbooks have either failed or proved futile in most of the cases. In a hurry to make the modern Indian languages the media of instruction, the supply of texts in standardized language has failed to match the demand. Educationally the treatment of subject matter in certain texts is sometimes ridiculously faulty.

The petty firms are flooding the market with cheap notes and help books. Experience shows that help books certainly help under the present system of examination. Greham's law works and the bad books drive the good books out of currency. This vicious circle will have to be broken. Let us reform the examinations before reforming the books. Thereafter, experienced teachers of high calibre may be encouraged to write textbooks, teachers' hand books and supplementary material. Textbooks Committees as recommended by Secondary Education Commission 1952-53 should be set up without hesitation.

The secondary school curriculum is becoming heavier day by day. A secondary school student in Punjab has to take up ten comparatively heavier subjects just after passing his middle examination in six subjects. The demands of the university or of social or political forces determine the place of a subject in the curriculum. Experts decide every matter without heeding much to the echo from the field. Psychological approach to the curriculum construction is ignored leading to unwieldy and lop-sided syllabuses which stunt the growth of students and pull down secondary education standards. It is suggested that curriculum research should be made a part of 'teacher training college' progsammes. Thus mass scale steps should follow pilot projects.

The teaching methods in secondary schools are stereotyped. The experienced teacher circumscribes the 'expected contents' of his subject under the shadow of the sword of Damocles, i.e., the fear of examinations. He then makes the students swallow it by rote learning. Creativeness and freedom are good things to be talked about. Dynamic methods which initiate and introduce the students to the joys of learning and help them explore their own field of study, is the crying need of the day. Here extensive reading, group methods, supervised study and assignment techniques can be helpful. But who has the patience to try; to stand and stare?

Large stocks of books—relevant or irrelevant—are lying stacked in secondary school libraries, without any librarian to look after. We can draw inferences of our own regarding the quality of library service. To raise educational standards, all big secondary schools should be provided with a librarian or at least the experimental schools to begin with as laid down in Third Five-year Plan. Class teachers can take up many such educational duties only if spared from other odd jobs, which have made of them the proverbial camel whose back any additional straw may break.

Educational standards bear a direct relation to the right selection of courses by students. Generally, the parents being uneducated and the students being yet immature, the choice of courses in secondary schools especially in higher secondary and multi-purpose schools proves to be wrong in the absence of a comprehensive programme of guidance services. Either it leads to sub-normal mental growth or stagnation in many cases. Once the students are caught in the trap, they become helpless. These trouble spots harm the educational and moral atmosphere of the school. Certainly the standards of secondary education will improve if a well-knit guidance programme is organized from school level to state level. At present about 12 states have guidance bureaus. Their resources cannot cover all students, and even their tools and techniques require Indianization.

A consideration of standards in secondary education should include the growth of pupils in aspects other than the intellectual, for example, the development of cultural, literary and artistic interests. It is all the more essential for age group 14-17 when their energies expand and diversify. But I doubt if ever any secondary school has emulated the enviable example of any public school of England in producing makers of history and destiny. In the crowded schools, space per student is miserably low. Co-curricular activities either do not exist or lack coordination. Teachers and students alike, consider them to be mere extras. Perhaps, the sites of new schools should be carefully chosen, some old schools shifted, amalgamated or even liquidated, open space movements set afoot by Improvement Trusts and well devised programme of physical culture and other activities be given due place in every secondary school curriculum.

The evaluation system in secondary schools has in no way contributed to educational standards. Quite apart from its defects on scientific grounds, it can justly be complained that it does nothing to whet the intellect of students. The school results day ends in festivities for a teacher if he shows a high pass percentage irrespective of quality and for the students if they get pass marks, i.e., 33% or a bit above. Thus, educational standards have become synonymous with the minimum requirements. The system may be a safe-guard against slipping of students to the bottom level but does not provide for raising them up. It is desirable that tests of present medium standard may be continued for those who terminate their studies at the secondary level but, since all geese are not swans a stiffer test be introduced for the brilliant. The work load of the secondary school teacher has made internal assessment a farce. Moreover, as long as the living of the teacher is linked up with better pass percentage and the pass percentage in its turn, linked with internal assessment. In these circumstances it is a far cry to expect integrity and honesty. Internal assessment is likely to stand in the way of raising educational standards.

Inspection and supervision provide an external stimulus for improving educational standards. But under the expanding programmes of education the burden of the job has outgrown the capacity of the inspectorate. They are busy in clearing the desks, while supervision has become a secondary job. Under the present higher secondary and multipurpose system, the nature of many subjects is such that very often members of the inspectorate are not competent for supervisory duties. The man on the spot, the headmaster cannot be expected to be the master of all that goes on in the school. He, too, has been swallowed by his own office. So at least in higher secondary schools, faculties of different subjects should be organized and the heads of each faculty be given due recognition and authority for supervision. Teams of subject experts should replace individual inspectors to improve and maintain standards of education in secondary schools. Decentralization in administration and control can also lead to better supervision and inspection and prove economical in terms of money and time from educational view-point.

Building and equipment have their own sad story to tell. Open air schools at secondary level cannot fit in the extremes of the tropical climate of India. Middle schools are upgraded to high|higher secondary schools with no corresponding extension in buildings or sometimes none for a long time. The next result is that teachers work under very uncongenial circumstances, and bad weather too wastes working days. Firstly, we shape the buildings and then the buildings shape us. Hence school buildings of reasonable standards are a great necessity. But the upgrading of lower schools to higher secondary schools has created such a heavy demand for building material and other equipment that the rational industry and the sources of the P.W.D. have failed to cope with the demand. The number of higher secondary schools with science elective group will increase from 4625 in 1960-61 to 9500 by the end of Third Five-year Plan. But even now how many schools can boast of laboratories worth the name. Conditions are the same in other subject of technical nature. Haste makes waste; quality and efficiency have suffered enough; let steadiness lead to standards.

After Independence, the fluid educational policy of certain state governments especially the bilingual ones with their jugglary of language formulas; switching over to new media of instruction regardless of the availability of books and proficiency of teachers; shifting of priorities of school subjects from time to time, disrupting the coordination between the policies of the Education Department and universities or school boards, have kept everything in the melting pot. The nature of the middle standard examination has so far been such that any real shifting or screening has not been possible at this stage. All this has weakened the foundations of secondary education and has made the educational journey upto the secondary level a non-stop one for all. Throwing down English to the bottom place even at secondary level in a fit of emotions has slashed down the achievements of students in other related fields. Thanks to the authorities, many of these steps have been retraced. Now draining off students after middle schools into trade schools or technical high schools and feasible diversification of courses should be stressed to boost up secondary education standards.

Last but not the least the policy of nationalization of denominational secondary schools cannot be conducive to educational standards. Besides many other disadvantages, these schools will also be caught in red tapism and inter-school competition-spirit will vanish. The right course is to improve the financial aspect of all such schools, adjusting Government control properly, safeguarding service conditions of staff and engaging the interest and attention of popular local organizations for cooperation and help in all matters to all secondary schools.

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IMPROVISATION OF INSTRUCTIONAL AIDS AND THEIR EFFECTIVE UTILIZATION

M. VIVEKANANDA

THE MODERN trend in education lays emphasis upon the fact that a secondary school of the future should no longer be an abode for 'Bookworms' and turn itself into a 'Learning Factory' but it should be a 'Child Centred Activity School' providing for its pupils, rich, pleasant and stimulating environment. The old order of education, being a mechanical process, should yield place to one of a deliberate activity in which pupils have a vital role to play. They should no longer be passive listeners, but active participants in the process of teaching and learning, the teacher being only a guide and a senior learner whose job according to modern conception is to provide situations, wherein pupils can discover knowledge and express their individualities or personalities through healthy activities and intelligent exercise of different faculties. Quite in keeping with this dynamic function of the school is the stress laid on the Audio-visual method[1] of teaching and learning to make it as concrete and practical as possible. This has naturally given rise to the use of several types of visual and instructional aids to make instruction practical and effective. For, all intellectual activity depends upon sense perception or seeing experience. The need and importance of the provision of direct sensory experience depends upon the fact that what the pupils see and handle, they are able to easily understand, remember and retain for a much longer time than if they merely hear the verbal expositions.

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[1] There is nothing like an audio-visual method of teaching and learning. Audio-visual aid however, help in making learning easy and concrete—Ed.

But the chief handicap faced by most schools to give effect to this dynamic method of teaching and learning and to make it concrete and practical is the prohibitive cost of the modern visual and instructional aids, not to speak of the lack of auditorium and dark room facilities. The phenomenal growth and heterogenity of the school population is another cause usually cited as standing in the way of organizing practical work individually or even in groups. In sufficient number of skilled laboratory assistants and attendars are some of the factors that seem to accentuate this situation. Two foreign educationists, who recently paid a visit to our Extension Services Deparment to see the improvised visual and instructional aids expressed the view that the same handicaps experienced in our country still existed in many parts of their state and several attempts were made by Teachers Associations to get over this difficulty. It is this problem in many backard countries that has given rise to the quesion of improvisaion of instructional aids and their effective utilization in the classroom.

From my experience of having taught and learnt science in as practical a manner as possible and conducted many courses and workshops on science and audio-visual education in several states in India with demonstrations on the utility of improvised visual and instructional aids, I find that the above handicaps can easily be got over and the teaching and learning of any subject be made interesting, effective and useful by the use of home made aids if only the teacher is earnest, energetic and enthusiastic with a love for experimentation with pupils during and out of school hours. In this paper an attempt is made to explain how this can be actually put into practice (in secondary schools) with marvellous results. To start with, the following few illustrations will prove the truth of the above statement. Let us take for example the teaching of a few lesson units in both language and non-language subjects such as English, regional language, science, mathematics and social studies at the secondary level.

I. (a) LESSON UNIT—

English Prose—'The Enchanted Horse'
Part I & II—Standard VIII.
5 periods of 45 minutes each.

(b) English Poetry— 'Boats sail on the rivers'— standard VIII. One period of 45 minutes.

II. REGIONAL LANGUAGE (TAMIL)

(a) Prose lesson on Musical Instruments—Standard VIII two periods of 45 minutes each.

III. (a) Mathematics—Kinds of Triangles—Form III
Surface area and Volume—Standard X
one period of 45 minutes.

IV. SOCIAL STUDIES

(a) Kinds of Sands in India—Standard VIII—one period of 45 minutes.

(b) Various Types of Transport.

V. GENERAL SCIENCE

Food and Feeding Habit of Animals } Standard IX—Two periods of 45 minutes each.

It may be said, without any contradiction, that the usual method of teaching these lesson units, in most schools is invariably the 'chalk and talk method' without any effort to use improvised instructional aids. Of course, there may be a few exceptions. Let us examine the two methods of teaching the lesson unit; English Prose—'The Enchanted Horse' Parts I & II for Standard VIII. The chalk and talk method may consist of a model reading of the lesson by the teacher; pupils may be asked to read the lesson paragraph after paragraph in turn, and at the end notes consisting of synonyms, using words and phrases in sentences and other grammatical points may be dictated. A few questions may be asked here and there and after that a summary of the story may be dictated or pupils may be asked to do that at home. Let us discuss for a while the effect of this lesson on the pupils. Has there been any motivation or interest or lively participation of the pupils? Here the teacher is the only active participant and the pupils are merely passive listeners. There is neither group work nor learning by doing. This method has given no scope for discovering the native talent or innate ability or potentiality of pupils. This is the case even in schools with a well equipped laboratory and modern audio-visual equipment such as filmstrip projector, film projector, epidioscope and tape recorder.

Let us examine the case of a teacher using improvised instructional and visual aids. Here there is previous planning and preparation on the part of the teacher and pupils. The class is divided into five groups of 7 or 8 pupils, each with a group leader and the following work in the preparation of projective visual aids are assigned to the pupils, supply the groups with Indian ink, slide drawing pens (croquil), Dori technique, transport colour leaves, brushes, glass slides, cellophane paper, drawing sheets, etc.

Stage I. Preparation of Projective Visual Aids

This consists of tracing the pictures in the book, such as Prince Firouz on the Enchanted Horse—the Horse rising into the sky, the Sultan and Prince Firouz recognizing the Princess, etc., on glass slides and cellophane paper slide and series of pictures on a cellophane strip in Indian ink. Colour slides and strips, typed cellophane slides and strips of questions for recapitulation are also made.

Stage II. Projection of the above Slides through an Improvised Projector Helioscope at the Time of Teaching the Lesson

HELIOSCOPE: This is a very simple improvised projector which can be made by any teacher at a cost of less than ten rupees and used for projecting any lesson unit at the time of teaching in the classroom on a white wall or white drawing sheet fixed on the black board without closing the doors or windows. The solar rays are reflected on the slide in the projector by means of a mirror fixed in a movable stand kept outside it. The slides, colour cellophane strips prepared by pupils are now projected as the lesson proceeds to the great delight of the pupils. Questions based on the pictures so projected are asked and eventually the story is developed from the direct sensory experience of the pupils. The typed slide and cellophane strip consisting of questions are projected in the end for recapitulation.

Unit I (B) English Poetry 'Boats Sail on the Rivers'.

A similar procedure as in the case of the prose lesson is followed for preparing colour slides and strips such as boats sailing on the rivers, ships on seas, bridges on rivers and rainbow in the sky.

When these are projected a few questions may be asked more for the appreciation of the poem. The poem itself is projected on the screen and the pupils may be asked to recite the poem in chorus.

One more step is taken in the case of teaching poetry. The reciting of the poem with proper rhyme and rhythm by a specialist teacher, or even a bright pupil, is recorded on the magnetic tape of a tape recorder and reproduced in the class for listening practice by the pupils and eventually the tape-record can be used for ensuring correct recital of the poem by the pupils. The aural and visual impression experienced by the pupils in this case, ensuring easy and correct recital, can be well compared to the easy recital of cinema songs by many pupils after seeing a picture in a theatre without even looking at the printed songs.

Let us now compare the effectiveness of using instructional visual aids in teaching these two lesson units with that examined in the case of 'chalk and talk' method.

In the first place there is cent per cent motivation as all the pupils become interested and lively on seeing the pictures projected, especially, their own.

Secondly the pupils become active participants in the process of teaching and learning as they themselves prepare these visual aids and also assist the teacher in projecting the slide, adjusting the mirror and operating the tape recorder or epidioscope, etc.

Thirdly the padagogic principle of 'learning by doing' is achieved even in the case of this language lesson as the pupils learn the sequence of the story as they drew the pictures.

The language ability and power of expression are more perceptible in this case than in 'chalk and talk' method. Besides there is the possibility of discovering the native talent, innate ability or potentiality, qualities of leadership and histrionic alents of pupils as some of the bi-product value evinced by the improvisation of instructional aids by both the teacher and the taught.

Lesson Unit II Regional Language (Tamil): Musical Instruments—Standard VIII.

1. The same procedure as in the case of teaching of the English Prose may be adopted for preparing slides and strips on musical instruments.
2. Actual musical instruments and improvised ones are displayed and made use of in the class.
3. Actual music played by the instruments may be tape recorded and reproduced in the class. It has been found[2] that as in the case of the English prose lesson, the effectiveness of teaching regional language using improvised aids is very considerable.

In fact a similar method as used in the case of teaching English poetry was adopted in the case of the regional language also in one of the courses on the teaching of regional language, the teachers acting as pupils. Marvellous results were achieved. The teachers who participated were surprised at their own potentialities of preparing as many as 50 slides and five cellophane sound filmstrips using tape recorder during the course of 30 minutes with another 10 minutes for projecting them and 10 minutes for discussing the effectiveness of using the improvised instructional aids. The unanimous verdict of the participants was that teaching through the use of improvised aids was most effective, economic and dynamic.

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[2] Reference to relevant research is needed here —Ed

Lesson Units III & IV. Mathematics and Social Studies:

In the case of mathematics and social studies too the use of improvised visual and instructional aids prepared by teachers for selected units was tried with great success and commended for implementation in schools. Besides the various types of slides and cellophane sound strips on kinds of triangles, cube, cone, cylinder, sphere, hexagon etc., algebraic sums in mathematics, and kinds of transport from the ancient times up to the present day in the case of social studies; three dimensional non-projective aids in plasticine were also made by them. The cost, the time taken for preparing them and the effectiveness of the aids were discussed at length at the workshop. It is found very economical[3] and time saving for mathematics teachers to have rolls of cellophane strips containing sums for projection, one series after another. Much time wasted in dictating the sum is obviated and more sums can be done by the pupils during a period of 45 minutes duration than in the case of the 'chalk and talk' method.

Lesson Unit V. General Science—Food and Feeding Habit of Animals—Standard IX — 2 periods of 45 minutes each:

Of all the subjects, the teaching of science is the most suited for teaching and learning with the aid of improvised instructional visual aids. The motivation is cent per cent successful, there is ample 'learning by doing' and greater active participation of pupils in the process of teaching and learning. The display of native talent, innate ability and potentiality is more perceptible in this case. There is plenty of scope for the development of powers of observation, critical thinking, manipulative skill and a scientific attitude on the part of the pupils so as to make them self reliant and highly resourceful citizens of the future. A lesson unit on Food and Feeding Habit of Animals for Standard IX was actually taught by adopting the above method in one of the intensive work conducted at the Saurashtra Secondary High School at Madurai, for the pupils of Standard IX. The science teacher was very enthusiastic. He divided the class into five groups and a leader was elected for each group. The groups were assigned tht following works:

- Collection of actual specimens of earthworms, snail, butterfly and leech.
- Preparation of various types of slides.
- Preparation of sound cellophane strips.
- Making of models in plasticine.
- Making of cheap specimen cases in coconut shell and bamboo for preserving the animals and insects.

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[3] The claim appears to be doubtful. Most teachers refer to questions in the textbooks which the students bring to schools along with them —Ed.

It was interesting to note the great zeal of the pupils. All the pupils without any exception were actively engaged in the preparation of projective and non-projective visual aids such as slides and models, preparing script for the sound cellophane strip in the form of a conversation between the teacher and pupils on the lesson and recording this on the tape recorder. Within about 30 minutes, as many as 50 aids were prepared by the five groups and the leaders of the groups projected those slides and strips prepared by each group with a commentary on the lesson. Their joy knew no bounds when the tape recorder was operated to play back their dialogue on the lesson to synchronize with the picture projected on the screen. The teacher spent 15 minutes for discussion and recapitulation. Apart from the practical experience gained by the pupils, their perceptional knowledge of the subject gained through direct sensory experience was found to be greater than that observed in the 'chalk and talk' method. In another case of intensive work in science of this type conducted for middle school teachers at the P.K. Nadar's High School, Tirumangalam, it was met with still greater success and the teachers and pupils were very enthusiastic and earnest and this made them prepare a number of improvised instructional aids and conduct a series of experiments of Plant Physiology all out of improvised aids made from the materials available in the laboratory. One of the chief factors that contributed to the very good and tangible intensive work in science on improvision of aids in that school was the genuine interest and earnestness of the headmaster who was responsible for initiating such a programme in his school without much dislocation in the normal work of the school. With the assistance of the Department of Extension Services, Thiagarajar College of Preceptors, Madurai, the intensive work of this type organized in a few more girls' and boys' schools in the city of Madurai contributed much to the practical method of teaching science with a variety of improvised aids.

Space and time forbids me to quote a few more instances to substantiate the effectiveness of the improvised aids. The best way of testing this is to try this method and observe the results. From my own experience and that of a few teachers whose work I have observed, I feel that if only the teachers have the inquisitiveness to go through the books dealing with the practical aspect of teaching and use a little bit of their imagination, a good lot of improvised instructional aids can be made in the Science Club of the school and that will go a long way in augmenting the poor equipment available in schools for teaching the various subjects in secondary schools. As an illustration in point, the improvision of an arc lamp projector made out of four carbon rods taken from used torch light dry cells for projecting lessons, as in the case of the Helioscope with practically no expense at all, and a simple device consisting of only a slide glass and a watch glass for projecting live specimens such as mosquito larvae or other microscopic organism living in water, will bear testimony to the marvellous results achieved by one's imagination. So far, the scope of improvisation of projective visual aids and their effective utilization for enriching and vitalizing classroom instruction have been dealt with.

Let us now examine the utility of a few cases of non-projective three dimensional improvised instructional aids.

Improvised Black Board

The black board is the most popular and common non-projective aid which is the chief tool of instruction for almost all teachers. Even this, used scientifically, will be an effective aid for instruction. Even today complaints reach our ears that there are schools even without a black board although black boards can be improvised without much cost. There are many indigenous methods of converting a portion of the walls in the classroom as black boards. There are simple formulae for making roller black boards using unused maps and cheap canvass sheets. The teacher can make a number of them with the assistance of the pupils themselves. These roller black boards are very useful for visualizing temperature readings, route maps and exploded drawings to dramatize details. The modern magnetic boards for displaying pictures and for explaining internal structures and dissectable parts can be very easily improvised.

Similarly for the teaching of social studies, relief maps can be improvised in various ways by using papier-mache, saw dust, tamarind seed dust, plasticlay instead of going in for costly relief models. In fact a colourful relief model of the world in papier-mache as big as 7½ feet in length and 6 feet in breadth was made by the pupils of Thiagarajar Model High School under the guidance of the science teacher and the art master of that school and this was displayed at the Fifth Annual Science Fair and Science Talent Competition held at Thiagarajar College of Preceptors, Madurai, recently. A prize was also awarded for that group activity of the pupils. The great value of improvised relief maps lies in the fact that it is more realistic than any flat map and hence very valuable in giving meaning to the physical symbols on flat maps. Similarly, the time-cage aids for understanding time zones and the reason for them can be improvised with cheap materials. In the same way for the teaching of mathematics also a number of non-projective improvised instructional aids such as clinometer, models, in plasticine, cardboard, plastic, umbrella spokes, etc., can be easily made by teachers and pupils. In fact these were actually made and their utility demonstrated at the courses and workshops on teaching of mathematics conducted by the Department of Extension Services, Thiagarajar College of Preceptors, Madurai

Lastly improvisation of non-projective instructional aids in science is so vast and innumerable to quote that a separate paper may be required for that. Still a few typical examples of non-projective improvised instructional aids, their utility and inestimable value in vitalizing classroom instruction are worth considering. There is a general complaint that due to want of accommodation and lack of sufficient science equipment, it is found not possible to demonstrate experiments in the class nor conduct individual practical work for pupils in science. This is not so. The teachers and pupils can improvise a good lot of apparatus without much financial assistance. Even tables can be improvised for demonstration purposes using black boards and wooden planks, and wall cases for storing and displaying specimens. No management will grudge spending a few rupees on that, as once such materials are provided they will serve the purpose for years to come. For instance, a number of simple apparatus such as stands for holding test tubes, lenses, burettes can be made with the assistance of wood work instructor at the craft shed. Even if the craft work is abolished as is contemplated now, these can be done in the Science Club with the tools available in the club or laboratory. In fact at the time of conducting intensive work conducted at the Saurashtra Secondary High School at Madurai, a number of improvised apparatus and instructional aids made by both teachers and pupils at the Science Club were displayed.

Both for demonstration purposes and providing facilities for pupils to conduct experiments individually and in small groups, many useful apparatus can be improvised. A few examples will amply illustrate this statement and serve as a guide for many teachers who might not have made any such attempts at improvising aids.

Example No. 1 Take for instance, a lesson on the beating of the heart. Although it is not difficult for a teacher to secure for a while a stethescope from any pupil whose parent may be a doctor to make the pupils hear the actual beating of the heart and make them count the number of beating for a minute using the stop watch or a clock or a wrist watch, yet it is quite easy to make this stethescope in the Science Club very easily and in no time. Two long rubber tubes of one foot and a half in length are fitted to the inclined limbs of a Y tube and a small plastic funnel costing a few paise or a glass funnel in the laboratory is fitted to the vertical limb of the Y tube. Now the stethescope is ready for noting the beating of the heart. Two boys, A and B, may come forward to do this experiment, A serving as patient and B as doctor. After noting the beating, A may be asked to go up 10 steps upstairs and come down. Now B will find the beating of the heart faster. If A happens to be a girl, she may be asked to skip for a while and the same fast beating can be observed.

Example No. 2 In the same way the mechanism of human respiration can very well be demonstrated by tying two small balloons costing three paise to the two inclined limbs of a Y tube and inserting the vertical limb into the hole of a cork fitted in a bell jar inside it. A torn bladder is tied at the bottom rim of the bell jar to serve as the diaphram. Let a boy or girl C hold the bell jar and another D pull down the diaphram. Let other boys note the expansion of the balloons representing the lungs indicating the inspiration process. Let the pupils note what happens when the diaphram is raised. The balloon will shrink indicating expiration.

Example No. 3 Once a challenge was made to me as to how I would arrange for individual experiment to a class of 40 pupils especially in biology as for instance 'Osmosis in plants'. The teacher who challenged me with this example in mind was evidently under the impression that the only way of arranging for practical work for each boy on this topic was to secure 40 tall jars, 40 thistle funnels with 40 rubber pieces (to serve as semi-permiable membrane) and give one set to each boy to verify the experiment on osmosis. This, of course, is not practical. This will naturally cost at least Rs. 120 at the rate of Rs. 3 per boy for purchasing the apparatus. It is here that the ingenuity and resourcefulness on the part of the teacher for improvisation of apparatus came into play. The challenge was met in this way. The cost of conducting individual experiment for each boy, is only 20 paise for the entire class compared to Rs. 120. Each boy is given a glass tumbler, or beaker or any available glass vessel. It is half filled with water. Dry resin is purchased for 20 paise and each boy is given one resin. Each boy is asked to tie one end of a piece of thread to the stalk of the resin and other end to his pencil and suspend the pencil in the rim of the glass tumbler so that the resin gets immersed in water. The boy is asked to observe the condition of the resin at the beginning and the inflated condition of it after it is kept immersed in water for a while. This explains osmosis. Elicit from the pupils the reason for the resin getting inflated. Then explain that the diffusion of a less dense liquid, the water, into a denser liquid, the sugar solution, inside the resin through a semi-permiable membrane, the skin of the resin, is what is known as osmosis. Then compare this with the cell sap inside the root and the nutrient water surrounding it and how it is absorbed by the plant by the process of osmosis. Ever so many experiments can be conducted by each pupil provided, of course, these are planned well during summer recess so that without wasting much time after the reopening of the schools, pupils can straight away begin these experiments in the class or in the open verandah or in the laboratory or in the school garden if there be one. Much care is not needed for arranging these improvised aids. Even if they are broken they can be easily replaced.

Improvisation of aids comes to the rescue of many managements of schools, heads of institutions with slender financial resources because, with the improvised aids the same results and sometimes even better results can be achieved than the schools provided with plenty of costly apparatus. Due to want of space only a few examples can be quoted below:

Example No. 4 Teachers need not go in for a Ganong's Respirioscope which costs Rs. 25 for demonstrating 'Respiration in Plants'. This can be done with a flask and a test tube containing a little caustic soda and a beaker containing a colour solution with better results as shown in the Appendix. Some buds and two flowers are put inside a flask and is inverted. A test tube containing a little caustic soda (sodium hydroxide) is put inside the tube and introduced into the neck of the flask. A beaker is three-fourth filled with a colour solution and the flask is clamped to a stand so that the mouth of the flask is under the surface of the colour solution. In about 20 minutes the colour solution will begin to rise into the flask. This is due to the fact that the carbondioxide given out by buds during respiration is absorbed by caustic soda in the test tube and this causes the rise of the colour solution which indicates the amount of respiration taken place.

Example No. 5 In a similar way the action of a force pump can be demonstrated from an improvised aid made out of broken test tubes, glass jets, rubber tubes as shown in appendix at a negligible cost without spending much money for buying a lift pump costing Rs. 15.

Example No. 6 Electrolysis of water with an improvised aid is another notable example to illustrate the economy and value of improvised aid. This apparatus used for demonstrating electrolysis costs Rs. 20 Even in some schools where it is available, it is rarely used to demonstrate that water is composed of two gases hydrogen and oxygen in the ratio of 2:1; for the fear of handling it carefully and diffidence in doing this experiment successfully. But the improvised one can be easily handled and the cost for making it is practically nil except the cost of an electric bulb holder provided with a wire and a plug and the rest of the materials consist of a coconut shell and a fused bulb without glass. A hole is made in the coconut shell and the fused bulb with the two wires erect, is fixed to it tightly using sealing wax. It is filled with acidulated water. Two small test tubes are taken and each is filled with water and holding the mouth with the thumb inverted over each of the two wires of the fused bulb in water. Electricity is passed by putting the plug in the switch board. In a few minutes hydrogen will be collected in one test tube and oxygen in another in the ratio of 2:1. For this demonstration it may take 15 minutes, i.e., 1/3 of the period, the rest of the time can be spent in discussion and explanation and in allowing the pupils themselves to make this apparatus and try the experiment themselves.

As has been stressed already there are several other ways of utilizing the waste and thrown-out materials for making wonderful aids and exhibits in the Science Club and also increasing the availability of the materials for assigning individual practical work for pupils. If each teacher with the co-operation of 40 pupils under his care should try this simple method of improvisation, I am afraid, there will be even no place for storing the heap of materials, the boys will get for experimentation.

In conclusion let us sum up the utility and inestimable value of improvisation of instructional aids. In the first place it must be admitted that to improvise aids and make use of them in the classroom will take much valuable time of the teacher, but is well worth doing, considering the advantages derived. This may be relieved to some extent by the active participation of the pupils in the improvisation, the teacher playing the role of a mere guide allowing the boys themselves to make the aid in the Science Club or even during the acting period during working hours.

Improvisation of aids increases one's interest on the subject and the lessons become more alive. Further, 'learning by doing' adds considerably to the practical knowledge of the pupils. It also develops a spirit of investigation and a research attitude.

An improvised aid is considered more satisfactory and effective than the one purchased from a scientific firm in the sense that the former is simple enough and consistent with the use to which it is put; whereas, the manufactured article is so refined that it tends to distract the attention of the pupils, someimes even obscure what is to be shown. The improvised aid on the other hand can leave out all but the essential parts and so can be more useful in ensuring that what is to be seen is seen.

Regarding the question of cost, no doubt, the improvised aids are much cheaper and there *is* much saving in cost and amount spent on commercial products. But, it must be remembered that it is not for economizing expenditure in equipping the laboratory that stress is laid on improvisation but for its intrinsic value of enabling the teacher to realize the major objectives of teaching science or any other subject for the matter of that. Of course, it does not mean that schools can refrain from providing the normal requirements of the school, though improvisation of aids by teachers and pupils in the long run will make the school self sufficient.

Considering the ineffective and unproductive surrender value of craft work in secondary schools, confining only to making of a few common articles such as coat stand, cricket bat, a mirror stand, a book shelf, a spice box, not related to the teaching of other subjects, the present move in some states to abolish 'Craft work' in schools may be a welcome feature. But a modified scheme of craft work with the specific objective of improvising aids for the teaching of the various subjects both curricular and extra-curricular will be more welcome and this type of craft work will certainly prove to be a valuable adjunct to school.

The importance and the need for improvisation of apparatus in secondary schools becomes obvious at the present transitional period of national emergency when we have to conserve all our energy and resourcefulness to gear the school activities to suit the urgent needs of the country. The inestimable value of improvisation in developing the pupils' manipulative skill to make them self reliant and resourceful citizens cannot be over estimated and in fact it is this technique that may sow the seed for future scientists who alone can bring credit to our motherland, India, and an equal place in the comity of nations.

APPENDIX 1

WELCOME ADDRESS

(Delivered by Prof. A. C. Deve Gowda, Director, Directorate of Extension Programmes for Secondary Education, on the occasion of the First National Meet of the Winners of Awards of Seminar Readings 1962-63, held at the National Institute of Audio-Visual Education, New Delhi, from April 8 to 10, 1964.)

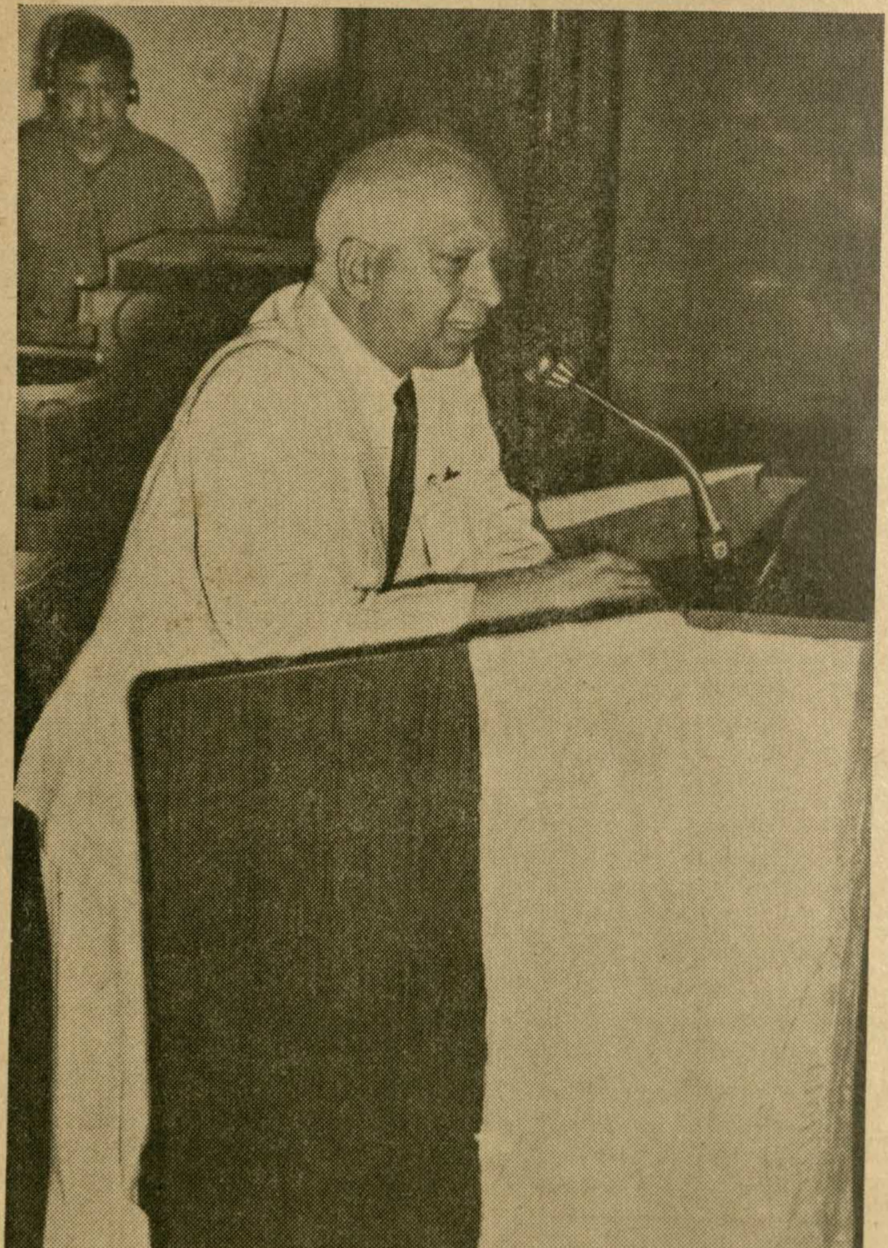
I have very great pleasure in extending a hearty welcome to you all to this First National Meet of the Winners of the Seminar Readings for the year 1962-63 organized by the Directorate of Extension Programmes for Secondary Education. Some time ago, we announced about a dozen subjects and requested teachers and headmasters of secondary schools and also people working in training colleges and those who are interested in education to study these problems carefully and to prepare papers of about 10 or 15 pages based upon their own practical experiences in the field of teaching and learning.

This competition at the All-India level was organized through our Extension Centres which, as many of you know, are attached to secondary training colleges all over the country. In almost all the 92 Extension Centres, the first scrutiny was done and the best papers from different centres were submitted to the State Departments of Education. The Directors of Public Instruction then organized a second scrutiny of these papers and sent about ten best papers to us for the final National Contest. As a result, we received 94 papers for the All-India Competition. And then we appointed judges here at the All-India level and they finally selected 20 of the best papers, and these 20 participants were requested to come over to Delhi to participate in this National Meet. Today, tomorrow and the day after, they will be discussing these papers with the help of experts from the National Council and also the Teachers College, Columbia University Team. After these papers have been discussed and finalised, we propose to print them in the form of a book. Out of these 20 participants, 18 are present here this morning; one of them is in America and the other is ill, so they could not come. All these participants will be given a cash prize of Rs. 500 each along with a printed certificate.

We are all very happy indeed that this programme of Seminar Readings sponsored by the Directorate of Extension Programmes for Secondary Education has been successful. This was for the year 1962-63. Now the Seminar Readings 1963-64 is already on and we are receiving papers from the State Departments of Education and we expect to finalise that also during the course of the next few months.

At the closing session

From left to right : Shri Raja Roy Singh, Joint Director, N. C. E. R. T; Shri M. C. Chagla, Union Education Minister; Shri P. N. Kirpal, Secretary, Ministry of Education; Shri A. C. Deve Gowda, Director, D.E.P.S.E.



Shri P. N. Kirpal, Secretary, Ministry of Education inaugurating the first National meet

APPENDIX 2

INAUGURAL ADDRESS

(Delivered by Shri P.N. Kirpal, Secretary to the Government of India, Ministry of Education, at the First National Meet of the Winners of Awards of Seminar Readings 1962-63 held at the National Institute of Audio-visual Education, New Delhi from April 8 to 10,1964.)

I am very grateful to the Directorate of Extension Programmes for Secondary Education for inviting me to this function which I think is a prelude to something very significant which will happen in this building in the course of next two or three days. Here is your invitation card which says, 'The First National Meet of the Winners of Award' which reminds me of the 'Arjuna Award' which we conferred on a very distinguished sportsman a few days ago. The reference is to a national meeting of the winners of awards, and I have been wondering, what is the main purpose of this programme of Seminar Readings. Is it a National competition leading to awards and prizes or something else? The competition part, as the Director has briefly indicated, is certainly very well organized. There were papers received at the level of extension centres and then at the State-level and now at the National-level. And all this is very reminiscent of what is happening in the field of sports. I do hope that it is not the competition part and the part of winning awards which is significant but what lies behind this programme.

Now I think this programme has a vital bearing on two or three things which are happening in our educational system today. In the first place, there is a new realization of the importance of secondary education in the entire system of education in the country. Of course, it has always been known, how important secondary education is in itself and as a link between elementary education and university education; and, from the economic point of view, as a stage, where the training of the mass of intermediate leadership takes place. Theoretically, all this has been known for a long time to all educationists. But in our own educational system although theoretically our educational leaders were aware of the importance of secondary education, in actual fact sufficient resources and sufficient efforts were not put into this sector of education. Even today there is a risk that the secondary school may not get what is due to it because we have such pressures at the lower stage, when we are committeed to providing free and compulsory education; to begin with, the primary level for five years and very soon for eight years. This is something which eats up our immense resources and with the growth of population and the spread of education in rural areas, the task is very great. It is tremendous, it is something where no cut is at all possible. If any child, boy or girl, wants to go to school, he must be provided with schooling facilities and not only that, we must do everything possible to bring girls into schools where sufficient numbers are not forthcoming and especially in backward areas, and also in tribal areas in some States. So there is great requirement in elementary education and there is also tremendous need in higher education. So between the two, secondary education tends to be squeezed out, as far as the provision of resources is concerned.

But it is now fully recognized by everybody that in order to make elementary education worthwhile, to have good teachers for elementary schools or to bring university education up to the required standard in a fast changing world, it is essential to bring our secondary schools to a much higher level than exists at present. This may be backed up by real practical measures not by paper schemes and programmes and manifestoes and proclamations which are often not followed by sufficient action. So I think the great thing which has happened in our educational system is the determination of the educationists, those who are responsible for planning, administration and for implementation of educational programme, that the secondary school is the crucial area and a very urgent area for reform and improvement. Now here the role of the teacher of course is crucial and what is needed of course is to provide the best possible training to the teacher to see that the technical competence of the teacher is improved. Now these two things are obvious, if we want to improve our educational system, we must strengthen the secondary school. We cannot strengthen the secondary school without having teachers of competence, of awareness, of character who will be able to produce boys and girls who are going to be potentially the leaders in different walks of life and also go to university for further training.

Now this programme of Seminar Readings is a very significant contribution to the improvement of the competence of the teachers. The training element is of importance. It is not the winning of prizes as the main objective of picking up 20 people and putting them in flash light here and giving them prizes. This I think is merely incidental but what precedes this thing at the 'Exension Centres-level', at the 'State-level' and here finally, is of the greatest importance. This should be a large chain reaction. The teachers, administrators, training college lecturers, and even university people should get together in these groups and discuss significant experiences and experiments conducted in high schools. They should also discuss philosophically the problem of secondary education. Now this kind of opportunity should be given to as many groups of educators among which the teachers must be predominent in number, because it is a programme for the improvement of teachers. But the important thing is to connect this programme with educational planning, administration, training college programme and university education. I think it is very hopeful in our programme for teacher training, specially in service training through 'summer institutes' that the university men are coming forth to work with the school teacher and ultimately that must be the most important thing in the reform of secondary school. Now in the 'summer institutes', we had a very close association between the secondary school teachers and the university teachers so that the up-to-date knowledge in various subjects could be given by the university teachers to school teachers and there is good get-together. This very close relationship between the university and the secondary school is essential. It has been lacking so far. The university people do not even know what has been happening in the school. I have met Vice-chancellors who have never visited secondary schools, but this association is being built up between the university and school and I hope also that there is a beginning of relationship between educational administrators, the State Supervisors, Inspectors, planners and the secondary school teachers which would be very useful and certainly contribute to improve the competence of the secondary school teachers.

So, I do hope that this National competition results in the nation-wide discussion among groups of teachers on educational problems; that it involves the teachers not only in the writing of an essay with the possible objective of seeing it published and of winning money award, but with the object of stimulating thinking, discussion, exchange of views among educationists who are interested in the improvement of secondary education; so I hope that this aspect of the programme will always remain paramount and it will be developed of course. I hope that the awards will not be only 20. In the large country of ours, it should be 40 or 60. There is no need of these things for recognition of merit, which is a good thing, but it is really the programme of discussion which is a part of training programme and making the teacher think and putting the teacher in touch with other people who are also concerned with the improvement of secondary education. I think one result from such a programme could be most welcomed and personally I would very much look forward to this result and that is the contribution of the teacher to educational planning. Certainly this programme will improve the competence of the teacher, it will certainly improve the awareness by bringing him in touch with other people.

What has been lacking in our educational system, and especially in our educational planning is the almost total absence of the thinking of the school teacher in the planning of the school programme. All the school programmes are planned by educational administrators, very often officers of the Indian Administrative Service and some time leading citizens who have had immature interest in education or university people and it is very seldom that you find a secondary school teacher or even a headmaster, who is involved in educational planning. I do hope that this particular programme will lead to the assertion of right of the teacher in the planning for the school programme specially the quality of education. In our planning what is often missing is the content of education. A great deal of emphasis is on the statistical figures on salaries, on financial estimates, on projects in terms. of number of targets. That is not education, that is not what happens inside the schools, in the relationship between the teacher and the student. The interest which is sustained in the classroom, how that interest is aroused, how knowledge is exchanged, how the personality of the student is developed are things of great importance. These are things relating to the content of education. And here is a great need for improving the content of education and doing something. There are great problems of different kinds, such as communication languages and over-loading of the curriculum. How can they be improved in order to make school programme and the work in the classroom more interesting and more fruitful? So I think that this aspect of the programme of the Seminar Readings would be, in course of time, the most significant aspect.

Now these 20 essays will be published. I hope that they will be widely read by the teachers and by the planners and by those who are responsible for educational administration and these kinds of publications could bring the thinking of the teachers and the educators who are working in the school or in the training colleges to the notice of the educational planners, to the wider public and then, as this programme gathers momentum, which I hope it will, there will be more and more thinking and discussion by the teachers of the problems in the school and this I hope would make very powerful contribution to our thinking in the Fourth Plan and for the succeeding plans and I hope the subsequent Five-year Plans in education and especially in school education will be the plans of the teachers—the Plans which are based upon the thinking of the teachers or the realization of the difficulties of the teachers, the problems of the teachers and of the day-to-day work in the school—and then we will move in the realm of reality. Even if planning has been quite successful—it has been very successful—there is room for improving it and I think the greatest improvement can be done by involving secondary school teachers in a very big way in the thinking about education and the planning about education.

APPENDIX 3

VALEDICTORY ADDRESS

(Delivered by Mr. M.C. Chagla, Minister of Education, on the occasion of the first National Meet of the winners of Award of Seminar Readings 1962-63 held at the National Institute of Audio-visual Education, New Delhi from April 8 to 10, 1964).

I look upon this as a very important event in the history of educational research in this country, and I am very glad that I am participating in it. This is an age in which tremendous advances in art, science and technology have been made. But we lagged behind in education in this country. There was a time when we used to teach our children only the 3 R's. We have progressed a great deal since then. Today, there is a deep thinking on many problems, there are new ideas, there is a ferment in educational work, research is going on and education has now become, to my mind, both an art and science. It is an art because the educationist needs vision and imagination and science because he has to deal with realities, he has to do research and these are characteristics of science. Therefore, this particular contest has a tremendous importance. We have given awards to 20 successful contestants; 800 teachers and educationists have participated in the Competition. That means, 800 people have made a contribution to ideas about education. These have contested at various levels, at the Extension Centre-level, at the State-level and ultimately about 80 or so at he National-level, and out of these 20 have been selected.

Now these papers themselves represent the ideas that the educationists and the teachers have with regard to the various aspects of education. Further, these lead to exchange of notes, stimulation of thought and comparison of experiences. All this is extremely good as far as education is concerned.

Miss Benjamin mentioned, quoting Mr. Kirpal, that in our educational planning we are very often overlooking teachers; perhaps we are guilty to that charge. I assure that teachers hereafter will have full participation in the new policy which we hope to promulgate as far as education is concerned.

I am often reminded of the fact that in the U.S.S.R. greatest respect is given to teachers and educationists. They have institutes of pedagogical science where outstanding teachers are made members and their views and ideas are considered from time to time. I think it will be worthwhile having some similar institutions in our country, where teachers will find a proper place in originating programmes.

Now I want to see some of the papers in which the contestants and awardees have described their experiences. I am myself deeply interested in the study of science, study of English, study of Hindi in non-Hindi areas, and teaching of 'gifted student'. I am myself tackling these problems and perhaps that is why we need these papers which are going to be published in the form of a book and also in various educational journals. Perhaps I might get a few ideas which might help me in tackling these problems.

I do not propose to make a long speech but I once more compliment those who organized the Seminar Readings, compliment those who have received the Awards and compliment all those who have taken trouble and pain to examine the papers at the lower and higher levels. This is a first contest of this kind and it is assured that the contest will be continued next year and I hope that you will get equally stimulating papers. Thank you very much for inviting me and I am very happy indeed to participate in this programme.

APPENDIX 4

TOPICS FOR THE ALL-INDIA COMPETITION OF SEMINAR READINGS 1962-63

i) Standards of education in secondary schools;
ii) Improvement of science teaching in schools;
iii) How to make teaching and learning more effective in secondary schools with reference to specific school subjects (any one school subject may be selected, for example, teaching of mother-tongue, teaching of foreign languages, teaching of mathematics, social studies, etc.
iv) Social studies in the secondary school curriculum;
v) Improving instructional aids and their effective utilization;
vi) Education of talented pupils in secondary schools;
vii) System of examination at the secondary stage—does it need a change?
viii) Health education in secondary schools.

APPENDIX 5

LIST OF NATIONAL AWARDEES OF SEMINAR READINGS 1962-63

No.	Name	Address
1.	Miss M. Benjamin	Alexandra Girls English School, 31, Waudby Road, Fort, *Bombay—1.*
2.	Shri M. Vivekananda	Co-ordinator, Extension Services Department, Thiagarajer College of Preceptors, *Madurai—9.*
3.	Miss Catherine Peters	Lalbagh Higher Secondary School, *Lucknow.*
4.	Shri R. P. Shah	Headmaster, Vividlakshi Viney Mandir, *Upleta, (Rajkot Distt.).*
5.	Mrs. Roma Gupta	Assistant Headmistress, Sakhawat Memorial Government Girls Higher Secondary School, *Calcutta.*
6.	Shri P. N. Bhoja Rao	Headmaster, National High School, *Barkur, (South Kanara Distt.)* Mysore State.
7.	Shri S. R. Chaturvedi	P. G. B. T. College, *Dewas.*
8.	Shri Z. N. Pathan	Science Teacher, *Asarwa Vidyalaya,* Asarwa, *Ahmedabad.*
9.	Miss Akhtar Qamber	Isabella Thoburn College, *Lucknow.*
10.	Shri Patrick P. D'Souza	St. Pauls Higher Secondary School, *Alwar Gate, Ajmer.*
11.	Shri J. S. Choksi	V. S. Patel High School, *Kosamba*, (Surat Distt.)

12.	Shri N. L. Pandit	V. B. G. S. Teachers College, *Udaipur.*
13.	Shri D. V. Ramakrishna Rao	Assistant Lecturer, Government Training College, *Rajahmundry.* (A.P.)
14.	Shri Prem Nath Sahai	Deputy Circle Education Officer, *Jullundur City.* (Punjab).
15.	Capt. A. S. Jayanandam	II Cross, Wilson's Gardens, *Bangalore–11.*
16.	Shri M. G. Chaphekar	Modern High School, *Poona–5.*
17.	Shri K. Venkataramai	Science Teacher, Sri Siddaganga High School, *Tumkur.* (Mysore State)
18.	Shri T. S. Hundal	Headmaster, Govt. Higher Secondary School, *Dharamsala,* Distt. Kangra (Punjab).
19.	Shri J. C. W. Rust	Vidya Bhawan, M. P. Higher Secondary School, *Udaipur.*
20.	Shri K. R. Shah	D. N. Vidyamandir, *Anand.* (Gujarat State)